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FEBRUARY 25th, 1943

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FLIGHT and The AIRCRAFT ENGINEER

FIRST AERONAUTICAL WEEKLY IN THE WORLD : FOUNDED 1909

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The Outlook

Trouble at Willow Run

THAT all is not well with the much-publicised Ford aircraft factory at Willow Run might have been inferred from an article which we published recently. The article described a new gigantic trailer used for transporting partly assembled Liberators from the Willow Run factory to assembly plants in the south-west of America, a distance of 2,000 miles. Our contributor pointed out that the assembly shop at Willow Run was inadequate to deal with the production of parts, and that the American Government decided to use two large plants already in existence in the south-west rather than build new ones in Michigan.

The U.S. War Investigating Committee has now ordered a full enquiry into the production at the Ford factory, and the chairman of the Committee, Senator Truman, has been reported as alleging that there has been so little production as to amount virtually to none. Which part of production he did not mention.

Until the investigations have been completed and the report published, one can but speculate on the real cause, but on the face of it "one bomber per hour" sounds a little ambitious. It would not be surprising if the Committee found that assembly was the bottleneck. It is always so very much easier to manufacture the small "bits and pieces" in huge quantities than it is to assemble them into complete aircraft. Probably Henry Ford has found, as did many of our firms, that there is a vast difference between assembling motor cars and aircraft. The very fact that the American Government should, as recorded in our article, have taken the somewhat drastic course of sending part-finished Liberators to assembly plants 2,000 miles away appears to indicate pretty clearly where the hold-up is likely to have occurred.

Torpedo Aircraft

IN our issue of February 4th last we made some comments on Lord Trenchard's statement in the House of Lords that the Admiralty "scoffed at torpedo machines," but that the Royal Air Force realised the value of them and kept them going. We pointed out that in January, 1937, the Fleet Air Arm had only 13 squadrons, of which three were torpedo-bombers, and that that was a fairly high percentage of the total.

Our attention has since been drawn to a Navy List of October, 1937, in which it is shown that the Fleet Air Arm included no fewer than ten torpedo-spotter-reconnaissance squadrons. Of these, six had previously been designated fleet spotter-reconnaissance squadrons, which had been converted into T.S.R. squadrons as Swordfish aircraft became available, while one, No. 813, had been raised in the interval. That disproves very effectually the charge that the Admiralty had scoffed at torpedo aircraft.

As for Lord Trenchard's other assertion that the R.A.F. had realised the value of such aircraft, the facts are that the so-called Metropolitan Air Force (i.e., the squadrons based in the British Isles) at the same date included only one torpedo-bomber squadron, No. 22, though there were two others, Nos. 36 and 100, at Singapore. Another squadron of that class, No. 42, was raised in Great Britain shortly after, so that when war was declared the Metropolitan Air Force actually had two squadrons capable of launching torpedoes from the air. As they were in 1939 equipped with Vildebeests, they had not the range to do much damage to the enemy. Of course, things were quickly changed when the Beaufort was produced in numbers, and that machine has done sterling work for Coastal Command.

From these figures one must conclude that through

the years between the wars it was the Fleet Air Arm which maintained its belief in the torpedo aircraft, while the Air Ministry only considered it worth a minimum of attention. We all live and learn, but at the same time we must protest strongly against an utterly unjustified attack upon the Fleet Air Arm.

Plain Facts About Air Transport

IT is good that the future of commercial air transport is now occupying the attention of all and sundry inside and outside the aviation world. Many committees have been formed, some self-appointed, to examine the whole vast subject and to press for immediate Government action. Most advocates of an immediate pronouncement of a Government policy in regard to the production and operation of large transport aircraft take as their cue that members of the Government are quite oblivious to the future, are not air-minded, and are definitely playing into the hands of Americans who, it is said, are all the time keenly planning aircraft types, world bases and routes for after-war operation. One thing is certain, real planning by operators or aircraft manufacturers in this country cannot begin until a Government policy in regard to air transport is announced. Since it is an international problem, it has been intimated by Government spokesmen that discussions with our Allies will be necessary before a policy can be promulgated.

This delay is irritating to those who do not view as the Government do, that war requirements are the more pressing. Obviously, we are suffering now from lack of official encouragement and planning four years and more ago. To be fair, many of the newer agitators among the Press and public were also silent at that time. To examine the matter dispassionately to-day it is clear that two to three years must elapse before large transport aircraft can be made available from British factories, in large numbers, so that it is highly unlikely that they would be of value in this war. Indeed, production of airliners would prove a definite diversion from essential fighters and bombers. That upsets popularly expressed ideas notwithstanding Mr. Winston Churchill's observations on this particular aspect of the question.

On the other side of the picture, when fighting ceases the lack of modern transport aircraft, save American productions, will have serious repercussions. The public to-day is air-minded, and generally convinced that commercial air transport will revolutionise travel when peace returns. They are not apathetic as is often urged. Is Britain to be shut out of the picture as a reward for concentrating upon military types of aircraft? Is the Empire to suffer for its patriotism? We refuse to believe it!

Those critics who imagine, or even recommend, cut-throat competition in air traffic after the war (they exist on both sides of the Atlantic) seem to conveniently forget the high aims that the United Nations are fighting for. International agreement is the only solution to this major problem, with its world-wide importance. It is essential, therefore, to know with whom the agreements will be made and the proper time to make them. As Mr. Anthony Eden intimated last week, Russia will certainly enter into the picture, and there are other countries whose views and ideas must be obtained and considered, since not only world passenger transport, but also cargo traffic, by air have necessarily to be studied and regulated. The need is undeniably urgent, but so are war needs. At root, the impatience of critics is no doubt the realisation that for years past the Government has failed to encourage British air transport and to give air travel that official support which was its due. They would thus, quite rightly, sweep aside monopolies and go ahead energetically with the new era which affects our national prosperity and future security.

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KEEPING THEM FLYING: Ground staff of a Beaufighter squadron in the Middle East busy overhauling one of their machines. Further photographs of this squadron appear on pages 204 and 205.

WAR in the AIR

Solomons Sea-air Battle : U-boat Bases Bombed : Stukas in Tunisia : "Luftwaffe" Distribution

A STATEMENT has now been published in the United States about the sea-air battle off the Solomons which began on January 29th and lasted until February 4th. It was another of those strange battles in the Pacific in which the heavy ships have not fought each other with guns but have used aircraft and "mosquito" warships for the attack. The Americans lost the heavy cruiser *Chicago*, which was the chief loss on either side. In small warships and in aircraft the Americans came off much the best, as they destroyed 60 Japanese aircraft for the loss of 22 of their own. We must wait to learn why the big ships never engaged one another.

This battle was followed by very heavy American air attacks on Rabaul harbour.

The Allied battle fleet and cruiser fleet will soon be substantially increased by the addition of French ships which have gone to America for repairs. When the time comes to strike with full weight at the Japanese octopus, the more battleships, cruisers and carriers the United Nations can place in the battle line the better. Sea power will win that war, and it goes without saying that sea power includes power in the air.

SPITFIRE BOMBER : The first published photograph of a Mark V Spitfire being bombed up by army personnel in Malta. There is a general tendency nowadays for all fighters—except those for specialised high-altitude work—to carry bombs either under the wings or the fuselage.

The principle was emphasised by Admiral of the Fleet Sir Andrew Cunningham in a recent statement. The sea side of the war in the Mediterranean was developing, he said, into a war of supply, and he gave a most encouraging account of how we were getting our supplies into Tripoli and were dealing with the enemy submarines. "We have had an excellent time so far in February," he said, adding "When I say 'we' I include the R.A.F. We cannot do anything without them and the Fleet Air Arm in these narrow waters," and he went on to compliment the U.S. Army Air Force on the share it has begun to take in the struggle.

In this connection, we have to mourn the loss of the Canadian corvette *Louisberg*, which was sunk by air action in the Mediterranean. Thirty-eight of the crew were lost. Corvettes are fast and very agile escort ships, and it cannot be often that one of them presents a good target to air attack.

U-boat bases on the Atlantic coast have been receiving much attention from American heavy day bombers.

TRIPOLITANIAN CONFERENCE : R.A.F. and U.S. air chiefs recently met at Castel Benito airfield to confer on the Tunisian campaign. (Left) Gen. Carl Spaatz of the U.S. Army Air Force ; (centre) Air Vice-Marshal Sir Arthur Coningham talking to Air Chief Marshal Sir Arthur Tedder. (Right) Air Vice-Marshal Sir Keith Park, who had flown over from Malta.

WAR IN THE AIR

After a series of devastating raids on Lorient, the U.S. Army Eighth Air Force turned its attention to St. Nazaire. The more these bases are bombed, the better.

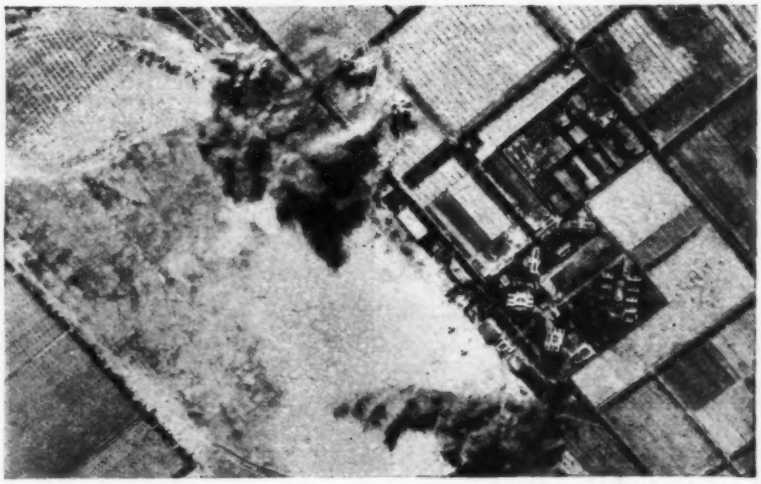
The Mediterranean War

THE repulse which the American troops have suffered in Southern Tunisia is regrettable on account of the losses in men and material, but as regards its probable effect on the war in that zone it is only irritating. The Americans had recently taken over that part of the line from the French (who, it is understood, are all being withdrawn to be equipped with new and up-to-date weapons and to be trained in their use), and it was only lightly held. These American troops were, as one American commentator has put it, "green." That is to say that they were in action for the first time, and had not learnt all the tricks of fighting which experience gives. Of the actual bravery of American soldiers there is not the slightest doubt, but it sometimes happens that inexperienced bravery causes unnecessary casualties.

Dive-bombing Attacks

ON this line there descended Rommel's heavy tanks, supported by swarms of dive-bombers. It has been noticed over and over again that dive-bombers appear very formidable to troops who are new to battle conditions. They are apt to take cover, when the correct thing and the safest thing is to remain cool and aim steadily with machine guns at the noisy devils from the sky. The diving Stuka presents a steady though fleeting target, and no deflection by the gunner is needed. The actual casualties caused by the bombs of a Stuka are rarely very considerable. The losses of the Stukas may be made very great.

The main surprise aroused by this battle is that Rommel's men were able to stage such a spirited attack after their 1,500 miles retreat from Egypt. Nothing is more demoralising to troops than retreat, especially after a defeat and also when under continuous and relentless pursuit and harrying by the modern substitute for cavalry—aircraft. We had been told that Rommel was all the time falling back on supplies of petrol (though at one stage numbers of vehicles and aircraft were abandoned for want of fuel), and that must have been true. He could not retreat for 1,500 miles with empty tanks. We also heard of great destruction wreaked upon his flying tanks and transport by the pursuing British fighter-bombers, and indeed the havoc must have been no light matter. But tanks have been proved to make unsatisfactory targets for air bombs, and it now appears that the majority of Rommel's Panzer divisions reached Tunisia, and reached it in a condition which made it possible for them to pass almost at once from demoralising retreat to formidable attack. We must also suppose that reinforcements of men and material were waiting for him in Tunisia. Those heavy "Tiger" tanks had not been with him at El Alamein or in Libya. Despite the efforts of British submarines, backed up by Allied aircraft, a very useful amount of war material has been hurried across into Tunisia.



BOMBING BENITO : Before the conference of Allied air chiefs (see p. 193) could be held at Castel Benito the airfield had to be captured from the Axis. In the bombing attack shown above, 14 enemy aircraft were destroyed at their dispersal points.

NEW GUINEA ATTACK : A Douglas A20 attack bomber (Boston) making a low attack on the airfield at Lae. The circles indicate disabled fighters, and in the foreground is a Mitsubishi Navy OB-01 twin-engined bomber which has made a belly landing.

Halving the "Luftwaffe"

A FLIGHT LIEUTENANT recently home from the Middle East estimated in a broadcast talk last week that quite half the strength of the *Luftwaffe* was now distributed between the Western Front (Northern France and the Low Countries) and the Mediterranean Front, and if that is to be taken as correct it shows that the German armies in Russia cannot have had anything like the amount of air support which it was doubtless reckoned that they would have when Hitler's "intuitions" prompted him to invade the Soviet Union. A report from Russia states that the cream of the *Luftwaffe* pilots now in that country have been kept round Leningrad, and that since the relief of that city they have been making desperate efforts to break through the barrage and bomb the place. It is to be hoped that

WAR IN THE AIR

these efforts are substantially reducing their number.

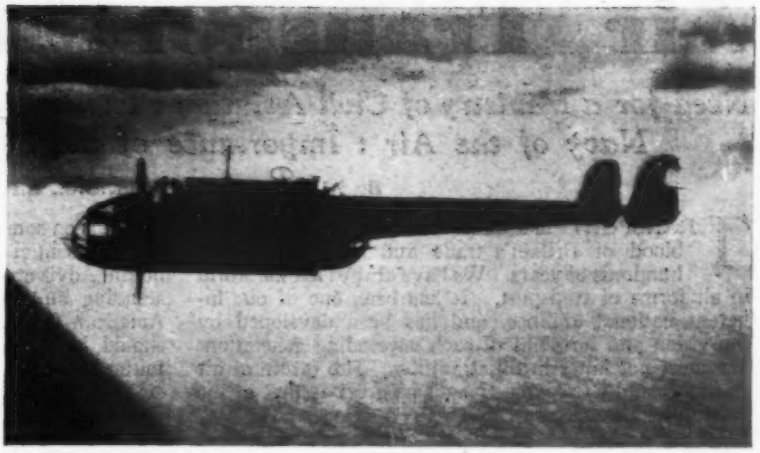
The Axis air bases in the Mediterranean have been having a bad time. American Army bombers from Africa have made daylight raids on Naples and on Crotone, a port on the south side of the "toe" of Italy. Malta is hitting out right and left. Her fighters have shot up factories in southern Sicily and others of her aircraft have strafed motor transport in Tunisia. Middle East bombers have raided airfields in Crete, and targets at Tunis and Bizerta are regularly bombed. Bomber Command has worked in with the air campaign from the south by every now and then sending heavy squadrons down from the north to hit luckless Milan or Turin, with an occasional visit to the naval base at Spezia, south-east of Genoa. The reality of the war is certainly being brought home to Italy, and it would be hard to believe that the popularity of Il Duce has not suffered as a result.

The Home Commands

NOT long ago the American Army Eighth Air Force in Great Britain made its first raid on Germany by a daylight attack on Wilhelmshaven. Bomber Command of the R.A.F. has followed this up with a particularly successful series of night raids. One of these produced an explosion which astonished the most experienced members of the crews which took part. Subsequent photographic reconnaissance has shown that the main ammunition depot of the port was hit. This was known as the Mariensiel depot, where torpedoes, mining materials, depth charges, and naval shells were stored in 50 long sheds. At least 40 of them have entirely disappeared, and huge craters appear on the spots where they were. The blast must have been terrific, and oil storage tanks 700 yards away also collapsed. Quite 150 acres in the neighbourhood have been devastated. This was a stalwart blow at the U-boat campaign, and it may even cause some inconvenience to the German capital ships which lie in wait in the fiords of Norway, hoping for a chance to pounce out and sink British convoys on the way to Russia. Still, it must be admitted that for some time past these battleships and battle cruisers have not expended much of the ammunition in their magazines. They have a great respect for the large British warships which always attend the convoys, and cannot afford to despise the torpedoes of the dashing little destroyers which screen the merchant ships and are always ready to attack any hostile flotilla, great or small.

For a long time past the Mustangs of Army Co-operation Command have been out pretty well every day attacking trains and railway signal boxes within their range. The Mustangs were designed as fighters, but their proper role in A.C. Command is that of tactical reconnaissance machines. Speed is now considered a necessity for that work, and so single-seater fighters have replaced the two-seater Lysanders. This railway strafing work has been given to them not only because it is useful in itself, but also to give the pilots occupation while they are waiting for the invasion of the Continent.

Last Friday the bombers of the A.C. Command staged their first big night operation against occupied France. As targets they were given a number of electric transformer stations along the Loire, which were not at all easy to find. This raid is the first definite news we have had that A.C. Command possesses a substantial bomber force of its own, though the need for one has been apparent ever since the Battle of France.



HOME FROM NORWAY: A Handley Page Hampden, with its tail badly shot up by *flak*, returns from a mission off the Norwegian coast.

ENEMY AIR LOSSES TO FEB. 20th.

	Over G.B.	Over Continent	Middle East
Feb. 14	0	4	1
,, 15	0	11	6
,, 16	4	3	2
,, 17	0	0	0
,, 18	0	1	0
,, 19	0	1	1
,, 20	0	0	1
	4	20	11

Totals: West, 6,642; Middle East, over 5,228.

BRITISH & U.S. AIR LOSSES TO FEB. 20th.

	Over G.B. A'crft.	Over Continent B'brs.	Over Continent F'trs.	Middle East A'crft.
Feb. 14	0	11	2	0
,, 15	0	2	1	1
,, 16	0	8	3	1
,, 17	0	0	4	2
,, 18	0	6	3	0
,, 19	0	14	1	0
,, 20	0	0	0	0
	0	41	14	4

Totals: West, 5,254; Middle East, about 2,077.

A.T.A. BENEVOLENT FUND

THE appeal for support for this worthy fund was launched in October last in a letter over the signatures of E. Colston Shepherd, B.A., B.Litt., of *The Aeroplane*, and G. Geoffrey Smith, M.B.E., of *Flight*, and the subscriptions received to date total over £5,500, and with A.T.A. and B.O.A.C. internal contributions over £7,000. Readers may like to be reminded that the fund was inaugurated for the benefit of serving members of the A.T.A., and its funds cover mainly the making of grants to ferry pilots or their dependants in case of incapacity through accident, and to their dependants when lives are lost in the service of the A.T.A.

A full statement of donations and subscriptions received shows that on January 31st last £5,457 18s. 8d. was the total from sources outside the A.T.A.

Regular contributions from personnel of the A.T.A. and the B.O.A.C. to the same date have amounted to £1,551 18s. 10d. Thus the grand total to the credit of this deserving fund up to the end of January was £7,009 17s. 6d.

A further list of recent donations is given hereunder. New contributions should be addressed to the Treasurer of the Fund at White Waltham, near Maidenhead, Berks.

To February 16th, 1943:—

	£	s.	d.
Marks & Spencer	10	10	0
Long Bros., Hyde Park Works	2	0	0
Filton & Sons	1	1	0
J. Stross, Esq.	5	0	0
P. F. Smith, Esq.	7	13	1
	£5,497	4	9
Contributions from personnel of A.T.A. and B.O.A.C.	1,551	18	10
Total	£7,049	3	7

Air Transport Planning

Need for a Ministry of Civil Aviation : The Evil of Monopolies : Merchant Navy of the Air : Importance of the Psychological Aspect

By ALAN J. COBHAM, K.B.E., A.F.C.

TRANSPORT has been the necessity and life-blood of Britain's trade and development for hundreds of years. We have always led the world in all forms of transport. It has been one of our inherent national abilities, and has been developed by the vision and foresight of each succeeding generation. We must not falter in this tradition. The future of air transport and its repercussions is as great as that of the Mercantile Marine.

We have always been a nation of transporters, and as soon as we cease to lead the world in transportation, the whole of British influence will wane.

Within the next few years air transport is going to bring about international travel and world communication on a scale hitherto unconceived in the history of man. Britain's great industry of the future should be aircraft and air transport. Here lies our great new hope, and, with the ever-changing dispositions of world trade, air transport is a particular job that we should grasp as one of the most important new lines of development to replace some of the trades and industries which may have left Britain for ever.

NO one in this country has done more in the past to "sell" aviation to the public than has Sir Alan Cobham. His many flights to distant parts of the Empire in years gone by opened many eyes to the possibilities of air transport. He was aptly nicknamed "The Apostle of Civil Aviation," and in this article he pleads for a treatment of air transport that shall be worthy of its great potentialities.

The development of aviation has been one of the most rapid, and perhaps the most revolutionary engineering success in modern history, and the superiority of British aircraft and personnel in the Battle of Britain saved us from annihilation and the world from conquest.

Necessary Ingredients

Our future success in the air depends upon the creation of a great aircraft and air transport industry, complete unto itself in every requirement, and manned by a resolute group of airmen, aircraft builders and all the types of specialists and artisans necessary to make up such an industry. Man-power, effort and materials are the only ingredients necessary.

I firmly believe that Britain can build the finest aircraft in the world. I believe that we have a natural aptitude in the young men of this country, and the necessary experience in the older men of the aircraft industry, to create and build the world's finest aircraft, and it would become an inherent national industry.

I believe that we have the finest material in the world (with full acknowledgments to the achievements of other nations) in personnel: pilots, navigators, maintenance engineers, traffic managers and all the staff necessary for air transport. Therefore, here is our big opportunity.

At the moment we have a great aircraft industry fully occupied in the production of war aircraft. We have thousands of aircraft operators working night and day in the Royal Air Force. A scheme must be evolved whereby we can select from these two great sources of supply the personnel and man-power necessary for the foundation of Britain's great peacetime industry.

It is impossible in this article to deal with every aspect of the situation, but the following are a few main headings on some broad general principles and policy :—

It is essential that for the next few years there should be an Advisory Aviation Board, composed of men of standing and repute, on much the same style as the American Civil Aeronautics Board. Failing this, there should be a permanent Parliamentary Standing Committee to advise the Government continually on the next steps necessary for the development of air transport. I am confident that had we had a permanent Standing Advisory Committee for Air Transport during the past fifteen or twenty years, all the troubles experienced in the past would not have occurred.

I would suggest that there must be a separate Ministry of Civil Aviation. Air transport has vast international interests and obligations, and the Government's concurrence on all developments is necessary. Those who suggest that the Department of Civil Aviation should be attached to some other Ministry, such as the Board of Trade, Ministry of Transport or the Air Ministry, lack not only foresight and imagination but comprehension of the magnitude of the immediate developments that are going to take place in aviation. This is not a side line; it is a far too big and virile industry to be tacked on to an existing Ministry, and the very nature of its ever-changing developments, inventions and progress would make collaboration with another Ministry unworkable. *Therefore, let us start off by having a new Ministry of Civil Aviation.*

Secondly, we must reorganise the air transport side of the industry and establish a variety of operating companies. There are two main branches of the industry—building and operation. Air transport and aircraft building should naturally run side by side, and on the one hand we have scores of companies to make the aircraft, but for some peculiar reason there is at present only one operating company! The aircraft building companies, the equipment manufacturing companies and many other parts of the industry owe their foundation to the orders given to them by the Air Ministry on behalf of the Royal Air Force. There are scores of companies which go to make up the existing British aircraft building industry, which has been the background to the R.A.F. and has made the production of aircraft for this war possible on a scale hitherto unconceived.

How to Subsidise

About a hundred years ago our forefathers evolved a scheme for subsidising the new invention of the steamship, and laid the foundations of our great mercantile marine.

However, they did not create one monopoly operating company; instead, they selected and subsidised several steamship companies, and as the years went by, the steamship developed and improved, and gradually the subsidies were diminished until eventually they became,

AIR TRANSPORT PLANNING

in many cases, mere token payments, and our mercantile marine was launched. Why not adopt the same well-proved process to-day?

The great essential in the development of British air transport at this period is that we should have more than one school of thought. The Government have made many blunders in their administration of civil aviation during the past twenty-five years, but the greatest of all was the appointment of the Hamblin Committee and the formation of Imperial Airways, a monopoly company, right at the birth of a new development.

The time for mergers and public utility corporations is not in the infancy of a new industry. There is no time to talk about past history, but it is worth remarking that the Hamblin Committee was appointed primarily because three small subsidised aircraft companies were competing with one another for a few months on the London-Paris route. The late Sir Sefton Brancker, Director of Civil Aviation, settled that little matter overnight by giving each of the three companies a separate route to work on, i.e., Amsterdam and Berlin to Daimler Airways; Brussels and Cologne to Instones; and Paris and Zürich to Handley Page.

If these companies had been left alone it is possible they would have pushed on to Scandinavia, Constantinople and Madrid. If this had been our policy, other companies would have been formed to operate the Australia route, South Africa route, the South America route; in fact, we might have been like America with a dozen different companies operating throughout the Empire. Most important of all, we should have had a dozen schools of thought, which would have been the right basis for an air transport industry to start on. There would have been a dozen traffic managers, a dozen air transport chief engineers, a dozen operational managers and a dozen different managing directors, all of whom would have had a point of view from which the Government would have been able to seek advice and obtain a well-considered and balanced conception of the requirements necessary for the further development of air transport. In fact, by such a policy, the Government would have got far more for their money than by subsidising only one company.

The Great Air Routes

However, do not let us dwell in the past, let us think of the immediate future, and as our forefathers planned the birth of the great steamship routes a hundred years ago, let us plan to-day the birth of our new great air route organisations.

The volume of air traffic on the Atlantic is big enough to support two, or even three, British airlines; added to this there should be a route to South America. Another company should operate the route through Africa. Perhaps another company would operate a route to Scandinavia, another company Central Europe, and then, of course, there would have to be a company to operate our great trunk route to India and the Far East. Despite the great advantages of our railway services in this country, eventually there is bound to be swift air transport to Scotland and an immediate development of air routes to Ireland.

This brief survey mentions some of the opportunities upon which air transport could get to work. Each of these possible routes should be operated by an independent organisation, and should share the benefits of Government assistance instead of, as at the present, the Government subsidy being the monopoly of a single school of thought.

Perhaps the most important aspect of the whole situation at this juncture is the psychological one. The majority of the youth of Britain to-day make heroes of our airmen. By studying aircraft and flying they aspire to get somewhere in aviation, and we may assume that a certain percentage of them will achieve their ambitions and make their dreams facts. Should they want to enter the air transport side of the industry, there is but one monopoly company for them to go to as matters exist at the moment. If a boy is worth his salt, he should aspire to a certain degree of success; to become a manager, a chief engineer, a commodore or a director; but if there is only one opportunity of such a position in the whole of British air transport, there will be many an ambitious lad who will turn back from a profession where the chances of becoming a senior executive are so remote.

An air transport industry built up by a number of operating companies offers to its personnel far greater scope for initiative and promotion than does a single monopoly company. It would not be an exaggeration to state that should a man in a monopoly air transport company fall out with his superiors in his own particular department, and find that his association with them was unreconcilable, his future in air transport would be damned for ever. However, if there were a variety of operating companies, he would have independence and could stick to his convictions and try elsewhere.

He might be able to do this more than once, and eventually find his niche and make good, and thus the air transport industry would not lose the services of a valuable servant. This has happened many times on the aircraft building side with good results. The abolition of the monopoly system in air transport would be a democratic move that would give freedom to the manpower upon which the industry depends.

In a young and virile industry such as air transport, where scope and initiative are essential, a monopoly company may tend to frustrate the individual.

It follows that if we develop air transport on the lines I have suggested, these many schools of thought would always bring about a healthy rivalry to the benefit of the operating companies. There need not necessarily be commercial competition between British companies, but the personnel of each separate service would be jealous of their own organisation's reputation.

The Civil Aviation Ministry would be responsible for organising a Central Committee with representatives from each operating company, so that all branches of operational experience and aircraft building requirements could be pooled and discussed for the further development of British air transport as a whole.

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GAS TURBINES AND JET PROPULSION FOR AIRCRAFT.

By G. Geoffrey Smith, M.B.E. 3/6 *net, postage* 3d.

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The prototype on its first test flight was in the air for about an hour, including a cross-country trip.

Constellation

Features of the New Lockheed Super Transport

Interested spectators of the first flight were Mr. R. A. Von Hake (left), vice-president in charge of manufacture; Col. B. D. Morley, U.S. Army Air Force; and Mr. Hall L. Hibbard, designer of the Constellation.

THERE was a new constellation in the sky over the California desert on January 9th, and it was heralded as the promise of faster, more luxurious passenger travel by air soon after the war is won by the Allied Nations. The spectacle was the initial flight of the super transport that had been designed and undergoing construction up to last year by the Lockheed Aircraft Corporation at Burbank, California. It was in the sky for one hour, half of which was spent flying from the works at Burbank to Muroc in the desert; the rest of the time circling the Army airfield at the latter place while engineers made observations before landing the craft on the field.

Constellation is the name given the aircraft, which was designed for passenger transport on the routes of Transcontinental Western Air and to mark a great advance in speed, range, safety, comfort and luxury in air travel. War interfered with these plans, however, and the first use of the craft, and others to be built to the same designs, will be as troop and cargo carriers for the U.S. Army Air Forces. Therefore, the machine was painted a drab olive green.

Much secrecy is still observed regarding details for military reasons, which prevent revealing full particulars of design, dimensions, etc. But it is permitted to describe the more interesting features in general terms and to tell something of the performance ability.

Early Estimates

During the design stage (the Constellation was due to have appeared in the spring of 1942) it was announced that the estimated top speed would be about 350 m.p.h., and that cruising on 50 per cent. power would give 285 m.p.h. As a cargo plane the net load was to be about 16 tons. These figures may now have to be modified.

The Constellation is the result of the desires of Jack Frye, of Transcontinental Western Air, for a passenger transport of the most advanced type that could possibly be built at this time, with the financial backing of Howard Hughes, and the research and design skill of the Lockheed staff.

More than 500 wind-tunnel tests were made in the course of the development; more structural testing probably was done than for any other aircraft; invaluable findings resulted from research laboratory testing of the cabin supercharger and its controls; many ideas contributing to effi-

ciency were supplied by the aerodynamics engineers; and structural and other groups of the aircraft company provided various important new ideas.

Combination of all the advanced features produced a craft of 8,000 h.p., provided by four eighteen-cylinder Wright Cyclone engines having a piston displacement of 3,350 cu. in. and a power/weight ratio of 1.1 lb./h.p. According to statements made, the Constellation has a range of approximately 4,000 miles, can carry 55 seated passengers and a crew of nine in an air-conditioned, pressurised cabin over the 3,000 miles from Southern California to New York in less than 9 hours, and from the Pacific Coast to Honolulu in 12 hours. It is claimed to have approximately 100 miles per hour higher cruising speed at about half-power than present standard air transports or cargo planes, and the maximum speed is now expressed as "exceeding that of any four-engined bomber or the Japanese Zero."

One Mile per Gallon

It is said that the Constellation will cruise continuously on a fuel consumption of 1 U.S. gal. per air mile. The high power for take-off with heavy load, the low engine weight and low fuel consumption are factors contributing to the long range. On three engines, flight can be maintained at 25,000ft., and on only two at 16,500ft.

Other highly important factors that make possible the speed, range, economy and a ceiling of 35,000ft. are the aerodynamic design of fuselage, wings and engine nacelles; exterior spot-welding on 75 per cent. of the fuselage and 10 per cent. of the wings; retractable manœuvring flaps which telescope into the wings; and a tail having three vertical fins.

The fuselage was built to a design chosen as the best of eleven shapes developed and tested. It has a perfectly circular cross section throughout, which is best for a pressurised cabin, but to provide optimum floor width (especially in the nose and tail) for comfortable accommodation of the largest number of passengers, the fuselage is cambered from the longitudinal axis fore and aft. This gives the forward end a shape somewhat resembling an aerofoil section which only moderately affects the lift distribution over the wing. An incidental advantage of the cambering is that a relatively short strut can be used for the nose wheel of the tricycle undercarriage, with a resultant saving of a considerable amount of weight.

Objectives attained by design of the triple-fin tail are: Moderate height of the craft on the ground; increased effectiveness of the elevator; and maximum control and safety of the plane in case of engine failure. Height of the Constellation on the ground is only 18ft. 8in., as against the 20ft. 9in. height of the 307-B, and 27ft. 10in. of the DC-4. This relatively low height is more readily accommodated under doorways and roof beams of hangars.

The tendency of air to spill off the ends of a horizontal tail surface is prevented by the outboard vertical fins, so that the air is controlled and made to do the work required of it when the elevator is deflected. In the event of engine stoppage during take-off or flight, this tail arrangement gives the pilot optimum control of the machine in relation to the effort he exerts.

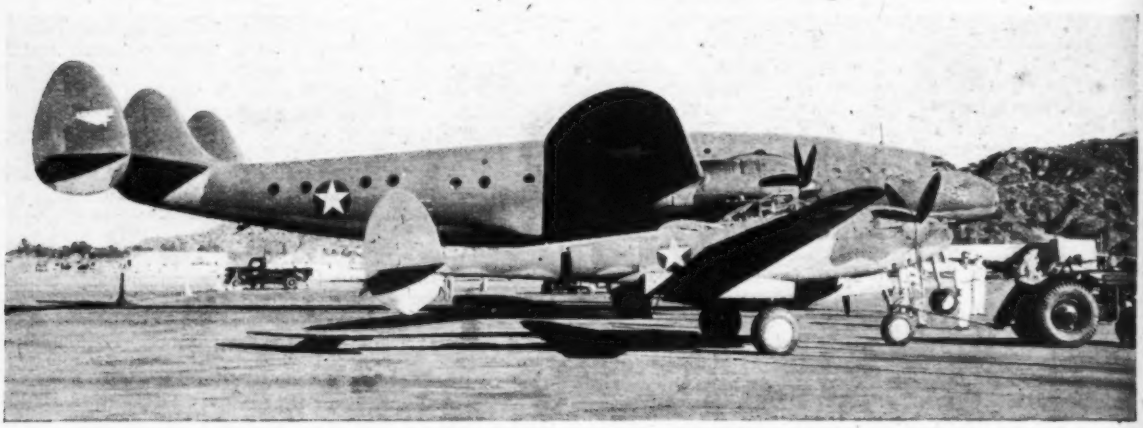
Wing design was developed from tests of the Lockheed Lightning P-38 wing, which the company believes to be the best compromise between a low-drag wing and a high-lift wing, and which has particularly good stall characteristics. Several wing types were tested in the wind tunnel, including laminar-flow sections which create little eddy-making at the trailing edge. These were found to have good gray characteristics but to be sensitive to any wing roughness that might be caused by ice formation, de-icers or walking on the wing skin, and therefore were not considered well suited for a passenger transport aircraft.

Moreover, the value of a wing section cannot be judged from its own characteristics alone, but must be ascertained in conjunction with the effect of operation of wing flaps, as high-lift devices to give low landing speed are a basic requirement in the design of the craft, and their effect on wing-section characteristics is of major importance. The wing form chosen after tests and consideration of all the factors involved is an N.A.C.A. (National Advisory Committee for Aeronautics) section having no aerodynamic twist, and is, in effect, an enlargement of the wing of the Lightning.

A novel feature of the wings is incorporation of manœuvring flaps which telescope into the wings and, together with the time-proved Lockheed Fowler flaps for

The Constellation approaches to land. Double main wheels and dual wheel brakes are a feature. The fuselage shape is reminiscent of certain early wing sections with reflexed trailing edge, designed to give small travel of the centre of pressure.

CONSTELLATION



The Lockheed P-38 Lightning under the wing of the Constellation. Each is claimed to be the fastest in its class. The wing of the new transport is similar, aerodynamically, to that of the fighter. It is fitted with ordinary Fowler flaps and so-called manœuvring flaps.

reducing landing speed, give three sets of performance characteristics. When extended, the manœuvring flaps increase the lift for rapid climb or manœuvring at low speed in foul weather or icing conditions. Retracted into the wings, they do not interfere with high speed and long-range operation. The Fowler flaps, when lowered, reduce speed to 77 m.p.h. for safe landing.

Low-drag Nacelles

Design of the engine nacelles and cowlings also marks an aerodynamic advance, as the Constellation, with a 2,000 h.p. engine in each nacelle, is said to have no more drag than the 800 h.p. Lockheed Model 14 transport, which has a gross weight of 17,500 lb.

The cowling has a nose of small air-inlet area, and increases in radius gradually and continuously from the nose back to the largest diameter. This contour results in uniform increase in airstream speed around the nacelle without extreme velocity over any part of the cowling. Compression shocks on the cowl nose at extremely high speed, as in a sharp glide from great altitude, are avoided, yet air-pressure drop is sufficient to cool the engine during a low-speed climb.

Nacelles and cowlings are made of stainless steel and have a fire-proof bulkhead of the same metal separating the engines from the wing interior, with access to the engines from a walkway within the wing. Each nacelle is equipped with remote-control fire extinguishers and sixteen thermostatic couplings to warn the flight engineer automatically, but fire can burn in a nacelle for half an hour without interrupting flight or causing serious damage.

Engines are installed with particular attention to convenience and speed in servicing and maintenance. Power-plant assemblies are interchangeable, with all fuel, oil, water and electrical lines provided with quick-detachable connections at the fire-proof bulkhead. Oil-cooler flaps, cowl flaps, carburettor air ducts and the like are integral assemblies. Thus it is possible to make a complete power-plant exchange forward of the fire-proof bulkhead in approximately 45 minutes. The number of right- and left-hand parts has been reduced to a minimum, with removable engine mounts, exhaust collector rings, stack and tail pipe back to near the fire-proof bulkhead, engine cowling and removable nacelle cowling made identical.

To assure interchangeability between aircraft in service, the following parts were built on aircraft production jigs: Inner and outer wing panels; wing tips; ailerons;

The nose shows the peculiar aerofoil section of the fuselage. The engines are Wright 18-cyl. Cyclones of 2,000 h.p.

CONSTELLATION

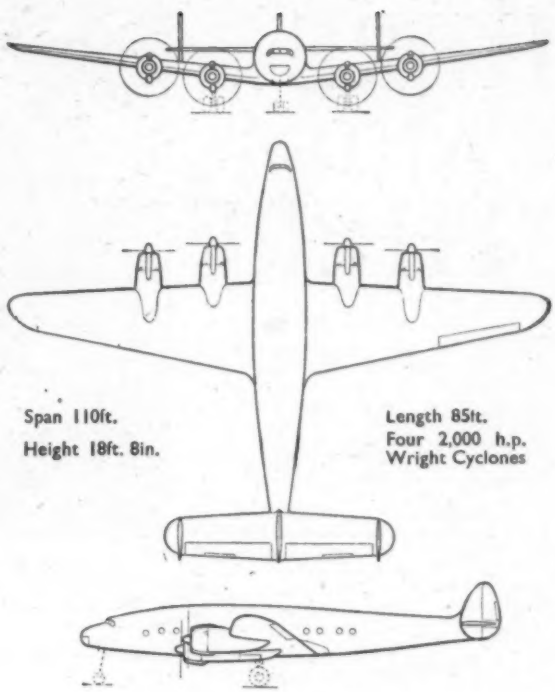
flaps; trimming tabs; tail fins; tailplanes; rudders; elevator; nacelle and engine cowlings; all parts of the exhaust disposal system; and the undercarriage.

When the Constellation project was started, a complete mock-up, comprising a duplicate of every item in the functional hydraulic system, was constructed for the purpose of testing all parts of the system. This made possible the running of complete tests of full-size pumps, valves, flap-control mechanism, cabin supercharging, undercarriage operation and power boosting equipment for operation of the control surfaces. This mock-up was operated through thousands of cycles under simulated flight conditions, including temperatures down to −70 deg. Fahr., before the machine was completed and flown. The expense involved is said to have been fully justified. It not only provided against possible loss or damage of the aircraft through functional failure of some part of the hydraulic system during flight testing, but disclosed inadequacies and led to many improvements in items of equipment normally purchased by the aircraft company. The hydraulic boosters connected with all flight controls relieve the pilot of most of the effort required to move the control surfaces, thus avoiding physical fatigue.

A special supercharger for the pressurised cabin was designed and developed. Either of two of these installed in the ship can maintain an air pressure equal to that at 8,000ft. altitude with the aircraft in flight at any height up to 25,000ft., and comfortable breathing pressure up to 35,000ft. altitude. The supercharger control system is designed not only to avoid rapid change of pressure during ascents and descents, but for maintaining a comfortable temperature by heating the air when the atmosphere is cold and cooling it when it is too warm, and also for eliminating smoke and stale air from the cabin.

Future transports of this design, if not the prototype, are to be equipped with de-icers heated by engine exhaust gases—a type first used in the United States on the Lockheed 12 and tested by the NACA.

The retractable tricycle undercarriage has dual main wheels with dual brakes and a steerable nose wheel. A retractable shock-absorbing bumper is also provided for emergency protection of the after portion of the fuselage and the tail assembly.



Provisional general-arrangement drawing of Lockheed Constellation.

Four independent lubricating and fuel systems are provided, and the inter-'phone communication system has stations for pilot, co-pilot, engineer, navigator, radio operator at the cabin entrance door, and at every nacelle and the external battery receptacle.

To minimise drag, all external seams except on the fuselage are butt-jointed, all permanent exterior fastenings either flush-riveted or spot-welded or the equivalent, and exposed non-permanent fastening devices and control hinges are of the flush type.

Air Transport

Concern Over Government Inaction

THE concern with which patriotic Britishers view the Government's lack of vigour with regard to air transport of the present and future is reflected in the formation of many committees all over the country. The aim is to urge more energetic action and the pronouncement of a Government policy. Such a plea has been consistently advanced in the pages of *Flight* for years past, but war needs have given the problem a new emphasis. Among the committees is one known as the Walpole Group, founded in March, 1941, by Dr. Stanley Walpole "to focus informed opinion on topics of national importance on which it is apparent that no adequate action is being taken."

The chief concern of the Walpole Group at the moment is the subject of air transport and the British position.

Among recent speakers was Mr. F. W. Farey Jones, who despaired of Parliament being in the mood to attend to civil aviation at present. He said the many committees studying this problem must unite in one common and immediate decision. We were racing not against time, but behind it. We had to stop giving ourselves medals over the Battle of Britain and realise the need for a change in British and Empire policy. It was no good blaming the Americans for being more far-sighted than we, and for building and planning air transport on a vast scale.

Mr. Farey Jones argued that neither the War Office nor the Admiralty, and probably not the Air Ministry either, could tackle air transport for war purposes, and suggested that a Ministry of Air Transport should be formed, which would have direct access to the War Cabinet. The existing Department of Civil Aviation could form the nucleus. When hostilities ceased, the Ministry of Air Transport could overnight become properly organised for civil air transport. The Air Transport Minister would have to create an Empire Air Council, and initiate a non-national Air Transport Commission to cope with post-war European problems.

Maj K. M. Beaumont gave a lengthy review of past air transport history. He touched upon such subjects as subsidies, "chosen instruments," mails and transport aircraft. For a strictly national line he did not object to subsidies. For the widespread British Empire and long-distance routes he did not consider that there should be one "chosen instrument." Lines such as the North Atlantic, South Atlantic, South Africa by the West Coast, India and South Africa via Egypt, the Far East and Australia and New Zealand, should each be a full-time job for a separate organisation.

Maj. Beaumont also gave some interesting figures on the financial aspect of the carriage of mail. At a rate of 2½d. per half-ounce, he said, 71,680 half-ounce letters, weighing one ton, produced £746. One penny added to the cost of 1,000,000 half-ounce letters, weighing 14 tons, produced the sum of £4,166. When Roland Hill proposed the flat rate of 1d. per half-ounce for postage throughout Great Britain 144 years ago he was ridiculed, but he was right in maintaining that the greatly increased volume of mail would soon pay for itself.

HERE AND THERE

ROYAL VISITOR. The Duke and Duchess of Gloucester recently visited stations of the R.A.F. Flying Training Command. Here His Royal Highness, who is an Air Marshal, is seen watching a tow cable being attached under the starboard wing of an Airspeed Horsa glider.

Seaplane Glider Launched

THE launching of a modified Falcon I glider from Lake Windermere was recently made by the A.T.C. Further experiments are to be made by Major Cooper Pattinson, who took charge of the winch of the speed boat, the pilot being Mr. W. W. Wakefield, M.P., director of the A.T.C.

German Boys Conscripted

IT is reported that German schoolboys of sixteen are to be called up for the *Luftwaffe* Auxiliary Services despite parents' protests. After a few weeks' training they will become dispatch riders or will work in defence centres exposed to air raids.

New American Types

AT a demonstration in Connecticut recently, new types of bombers appeared. They are said to be of advanced design and able to carry greater loads over greater distances than ever before. It is also reported that some new American fighters, with more powerful armament, will be able to fly at a higher speed than ever before attainable.

"R.A.F. on the Target"

AN exhibition of photographs taken by R.A.F. observers during raids on enemy territory was opened last week at Bank Buildings, 9, Princes Street, London, E.C.2. It closes at 6 p.m. on Saturday to begin a tour of the London suburbs.

Some of the pictures, of which there are about fifty, are as big as 6ft. by 4ft., and they show the extensive damage done to enemy war industry by the regular bombing of the R.A.F. An interesting innovation is that stereoscopes enable visitors to examine the prints in relief, while the R.A.F. officer in charge explains the details.

The exhibition is one of ten touring Britain and Northern Ireland, and sets of the pictures have been sent to Washington and Moscow.

R.A.F. Benevolent Fund

HER Royal Highness the Duchess of Kent has graciously consented to become the president of the Royal Air Force Benevolent Fund.

The office of president was formerly held by H.R.H. the Duke of Gloucester, who relinquished it when the late H.R.H. the Duke of Kent became chairman of the Council of the Fund. It has since been vacant. The chairmanship of the Council is now held by Lord Riverdale.

"Going, Going, Gone!"

A CHEQUE for 50 guineas has been sent from *Flight* to the R.A.F. Benevolent Fund in payment for the bid made through these pages for the coloured picture "In a World of Space," an illustration of which appeared in our issue of January 7th.

Airgraph Service from Eire

AN outgoing airgraph service from Eire will be introduced on March 1st, according to a recent announcement by the Minister for Posts and Telegraphs (Mr. P. J. Little). The service will apply to Canada, Newfoundland, Egypt, India, Palestine, Ceylon, Rhodesia, South Africa and the Sudan.

For the present the photographic work in connection with the service will be done in London.

Brazilian Conference

ON their journey from Africa to the United States recently, Field-Marshal Sir John Dill, Lt.-Gen. H. H. Arnold, Chief of the U.S. Air Forces, and Lt.-Gen. Brehon Somervell, Chief of the U.S. Army Service of Supply, stopped at Recife to see Señor Joachim Salgado, Brazil's Air Minister.

Sir John Dill is British military member of the Joint Staff Mission in Washington.

U.S. Production Appointment

MR. DONALD NELSON, U.S. Minister of Production, has deprived Mr. F. Eberstadt of his post as vice-chairman on the U.S. War Production Board. Mr. Eberstadt, who had been nominated to that post by the Army and Navy, is now succeeded by Mr. Charles Wilson.

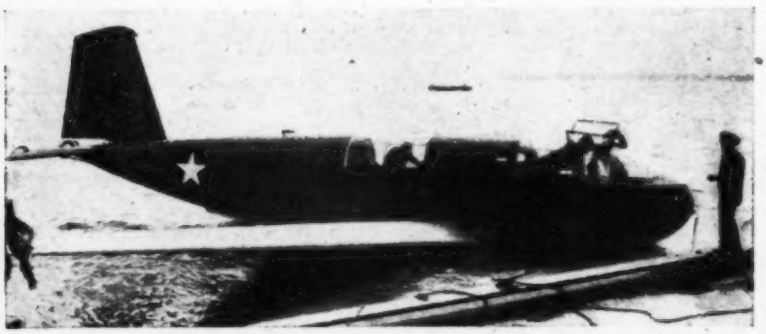
President Roosevelt was responsible for Mr. Wilson joining the War Production Board.

Mr. Nelson has hinted that he may retire in order to give complete control to Mr. Charles Wilson.

New "Bristol" Directors

MR. N. ROWBOTHAM, C.B.E., B.Sc., and Mr. K. J. G. Bartlett were appointed to the board of directors of the Bristol Aeroplane Co., Ltd., following the passing of a resolution, at an extraordinary general meeting on Monday last, by which the maximum number of directors was increased to eight.

Mr. Rowbotham has been engine works manager for the past 12 years and is now chief engineer of the engine division, while Mr. Bartlett has been with Bristols for 15 years, first as their Continental representative and more recently in charge of a group of the company's production factories.



AMPHIBIOUS GLIDER. A U.S. Navy experimental glider, the XLQ-1, was recently towed off the Delaware River by a Catalina and successfully landed again. Designed as an amphibian, it has a span of 72ft., a length of 40ft. and can accommodate 12 fully equipped men.

What does he see?

Just what does our pilot in embryo see as he gazes skyward. The Miles Master on which he will receive his monoplane training—for he is destined for fighter aircraft.

But he sees beyond that. He sees into the future. And he does not think it wrong that others should do the same. He sees prejudices between peoples which will be smoothed out in the future by swift air travel. He visualises a great chain of airways throughout the world, with British aircraft taking a share in their operation; express freight carried to distant romantic ports not in weeks but in hours. And though he may not know it, the makers of the plane in which he will complete his training share his vision and will be ready, when the time comes, to play their part.

Give generously to
The Royal Air Force Benevolent Fund

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Aircraft Types and

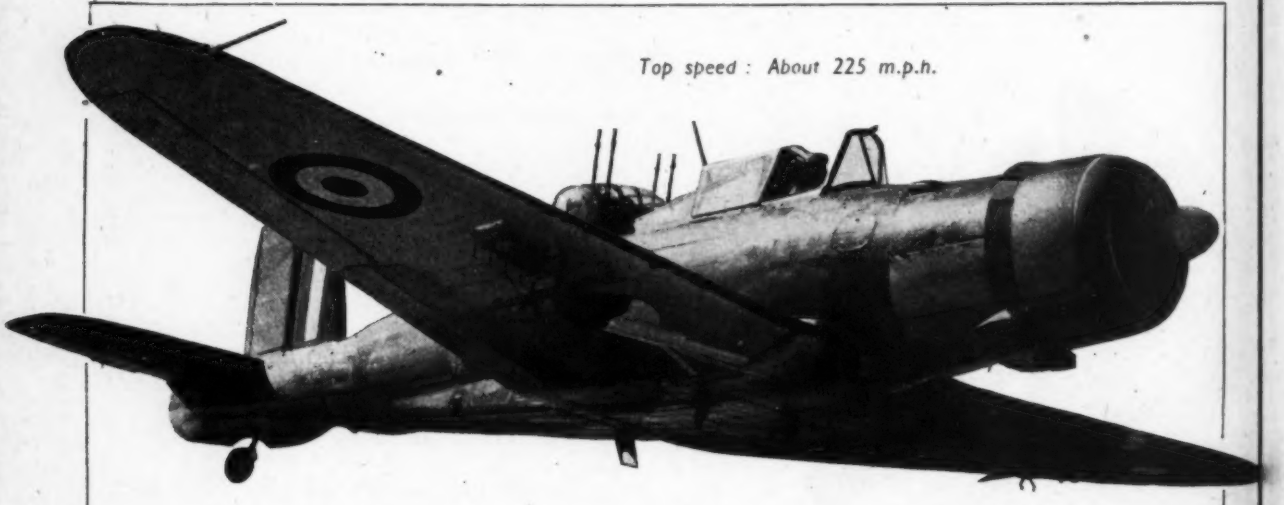
BLACKBURN ROC

ONE of the only two single-engined fighters to be equipped with a power-operated gun turret, the Roc appeared in 1939 as a development of the Skua, which it greatly resembles.

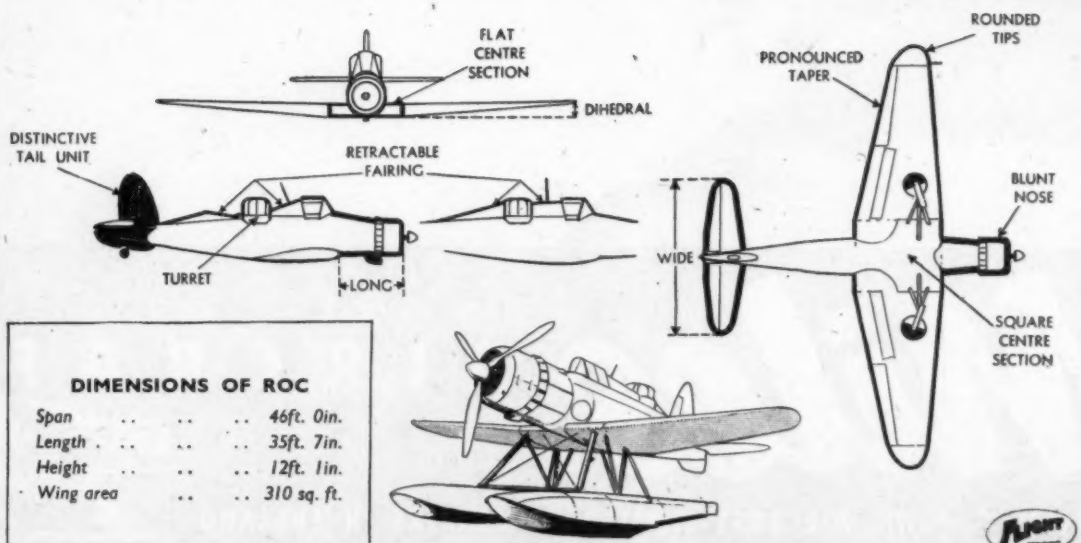
Its intended mission in life was the role of Fleet fighter and it could be equipped either with a wheel undercarriage (outwardly retracting) for operation from aircraft carriers, or as a floatplane as illustrated in the sketch below. Since the drag of a gun-turret would obviously be a serious speed-reducer to a single-engined machine of this size, and since a retractable turret was also out of the question for the same considerations of aircraft size, retractable fairings were provided fore and aft of the turret. These materially reduce "form drag" when raised, and allow complete traverse when lowered, nevertheless the top speed of the Roc, like that of the Skua, was scarcely up to modern operational fighter requirements. No official figures have ever been issued of the Roc's performance, although it has long since ceased to be on the secret list, but the top speed of the Skua, which has the same engine and is structurally similar except for the gun-turret, is quoted as 225 m.p.h. at 6,500ft., its cruising speed only 187 m.p.h. at 15,000ft., and service ceiling 20,200ft.

The power is supplied by a Bristol Perseus XII nine-cylinder, sleeve-valve, air-cooled radial engine of 905 h.p. within a long-chord cowling having a leading-edge exhaust collector ring and trailing-edge cooling gills. An interesting feature about the all-metal circular monocoque fuselage is that it has watertight compartments capable of keeping the aircraft afloat for long periods even if the two cockpits are flooded—a very useful asset in an aircraft intended for operations over the sea.

The wings, which fold, as on all carrier-borne aircraft, differ from those of the Skua in that they lack the turned-up tips which characterise the latter machine; they also have a much more pronounced dihedral angle from the narrow, flat centre-section. This and the presence or otherwise of the Boulton Paul four-gun power-operated turret provide almost the only visible recognition features as between the two aircraft. The distinctive tail unit applies to both.



Top speed: About 225 m.p.h.

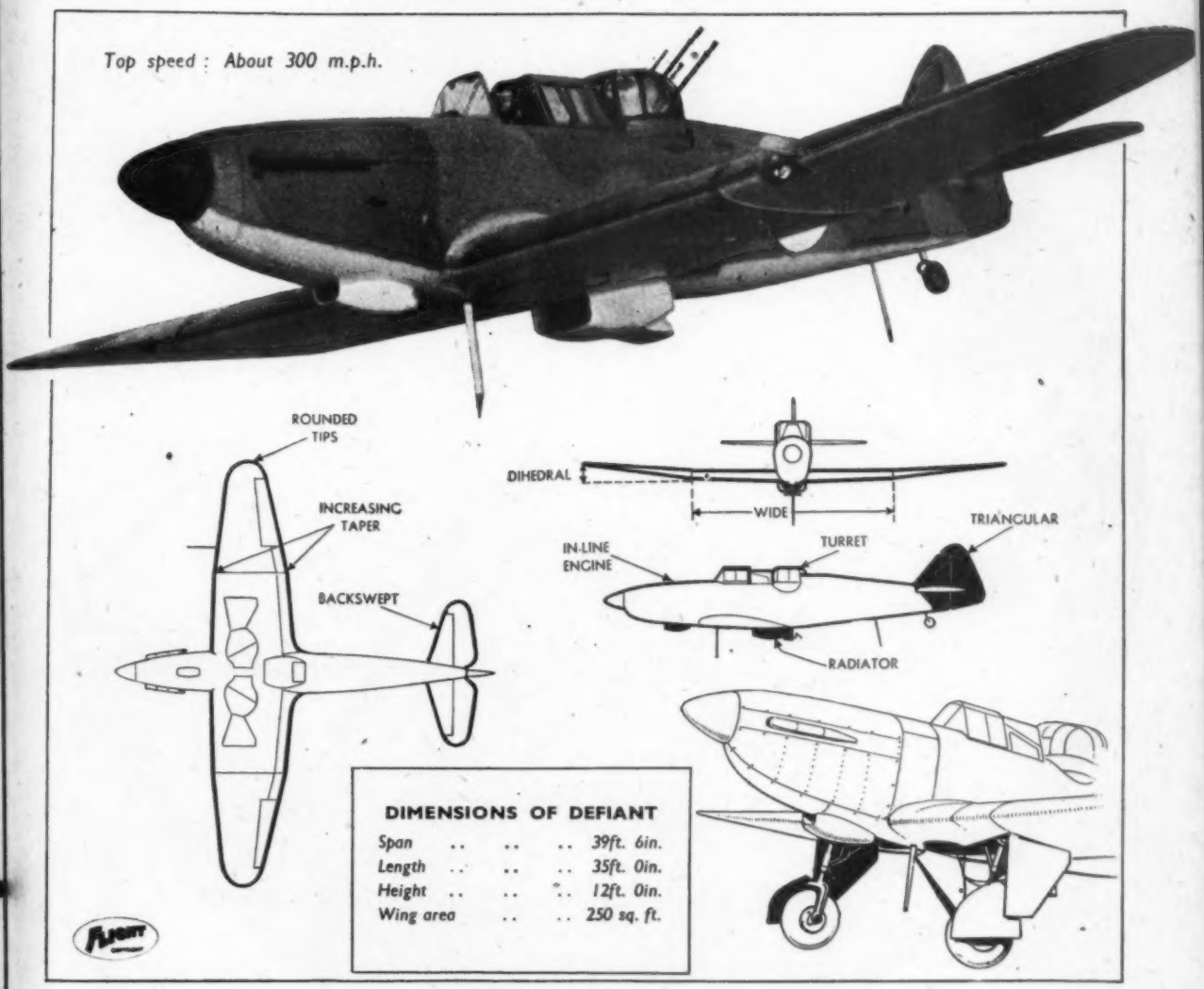


DIMENSIONS OF ROC

Span	*46ft. 0in.*
Length	*35ft. 7in.*
Height	*12ft. 1in.*
Wing area	*310 sq. ft.*

Their Characteristics

BOULTON PAUL DEFIANT

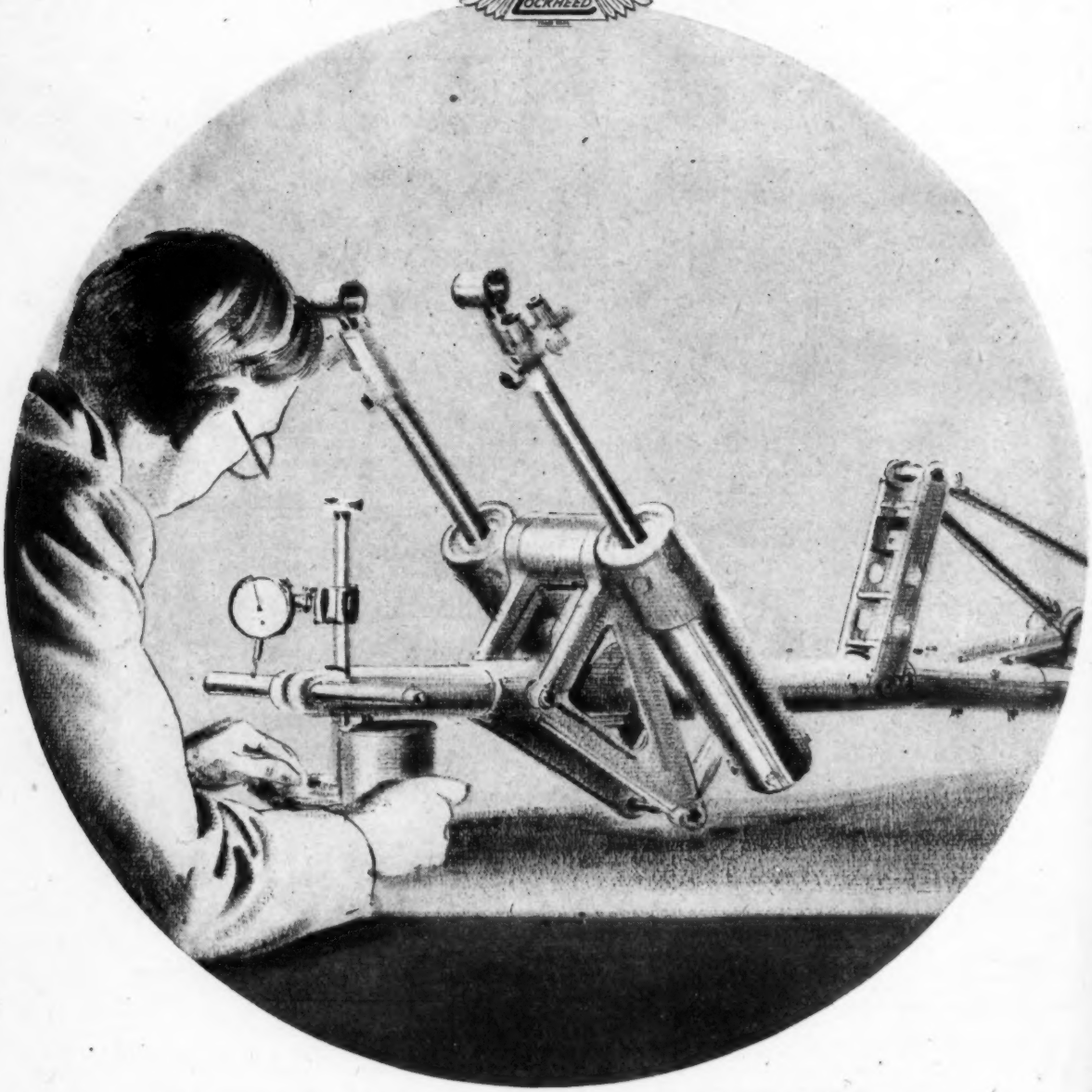


WHEN the Boulton Paul Defiant first went into operational service it carried with it a very useful but short-lived weapon of war—that of surprise. One day, near Dunkirk, a squadron of these, then new, two-seater fighters met a large number of Huns and proceeded to shoot down no fewer than 37 of them with their four-gun power-operated Boulton Paul turrets.

But after that initial massacre the Hun knew the important difference between a Spitfire or a Hurricane which, like their own single-engined fighters, had to aim itself in order to get an adversary in its gun sights, and a Defiant which could shoot to kill from almost any angle. They also discovered that the Defiant was not so fast, by a telling margin, as their own Me 109 and He 113 single-seater fighters so that, having used up its surprise value, the Defiants no longer held any advantage, at any rate in daylight. They were found useful, however, as night fighters where top speed is not always so important, until subsequent developments in the technique of night-fighting outmoded them.

When it first appeared, the Defiant was powered by a Rolls Royce Merlin II with a maximum output of 1,030 h.p. at 3,000 r.p.m. at 16,250ft. and a cruising output of 990 h.p. at 2,600 r.p.m. at 12,000ft. At this time the performance figures were not released for publication, but later versions of the Defiant were fitted with the increasingly powerful editions of the famous Merlin so that in its final form it was capable of something in the region of 300 m.p.h.—perhaps a shade over. But no two-seater, carrying the added weight and incurring the additional drag of a gun turret can compete with a modern single-seater fighter in the matter of that vital top speed factor; with the same engine it is bound to be many miles per hour slower in spite of retractable turret fairings.

Structurally the Defiant is all-metal with a flush-riveted stressed-skin covering. Its wings have an unusually wide centre-section of constant thickness but tapering slightly in chord. The fin and rudder are triangular and the leading-edge of the tailplane sharply backswept. An additional recognition feature is the position of the radiator under the fuselage amidships. Retractable wireless masts extend below the fuselage when in flight.



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Service and Industrial News from the Inside of Axis and Enemy-occupied Countries

For Altitude

EXPERIMENTAL work on a high-altitude aircraft equipped with a pressure cabin is reported from France. While full details are not available, the new prototype has an interesting power plant arrangement composed of two engines mounted side-by-side in the fuselage, and driving two contra-rotating airscrews. The aircraft is said to be capable of reaching an altitude of 49,000 feet.

Ala Littoria

THE effect of military transports on the operations of the *Ala Littoria* is shown in the company's report for 1942. During the period under review a substantial increase in the traffic volume has been recorded; the company's aircraft flew 2,600,000 miles and carried 82,182 passengers, or 75 per cent. more than in 1941. Over 3,000 tons of general goods were carried and the increase in luggage freight as compared with 1941 amounted to 84 per cent.

Draught

A LEADING daily in German-occupied Denmark published recently a description of conditions in Finland's capital, Helsinki. Attempting to enlist the support of its readers for some collection of funds, the writer throws an interesting light on the effect of the little-known bombing operations of the Russian Air Force.

"The Russians," says the writer, "are now waging modern war; they attack on moonlight nights. When you read the Finnish communiqués you would think that a kind of lull had set in, in the war. But that is the case only at the front. Russian air activity is permanent. Constant attacks are carried out on industry and the nerves of the population. Not only do the new heavy bombs cause more devastation, they also shatter windows for a much wider radius than was the case at the beginning of the war. And it is cold in Finland now. Factories work day and night to replace broken panes, but it is hard for them to keep up the pace. Every fragment of glass is collected for use as a raw material again. But often enough panes are blown out again as soon as they have been put in."

With Finland's climatic conditions, one can well imagine that under the blows of Russia's Air Force the life of the German satellites is almost as unpleasant as that of their Nazi friends in Western Germany.

Italian Chestnut

THE high consumption of liquid fuel forces the Italians to search continuously for some new sources for this vital material.

According to a recent report, alcohol-containing plants are to be used for this purpose, among them the wild chestnut. Italian sources estimate that 30,000 hectolitres of alcohol could be produced annually from this source.

New Japanese Alloy

THE Japanese *Domei* Agency reports that Professor Obinata has succeeded, after a long period of research work, in compounding a new important metal alloy. It is said to be 33 per cent. lighter than duralumin, and is to be employed by the Japanese aircraft industry for the construction of wing surfaces.

German Transport

FROM the Russian communiqués we learned about the endeavours of the *Luftwaffe* to employ Ju 52 aircraft for the relief of the encircled German forces in the Stalingrad area and elsewhere. The German Press now reports that 47,600 wounded have been transported by plane to different hospital bases in Germany.

Speed Limit

ACCORDING to Prof. Kleinwaechter, of the Aeronautical Institute of Danzig, only limited increase of aircraft speed can be expected in the near future. As a result of researches carried out by the above Institute the speed of sound is considered, for aerodynamic reasons, to be an insurmountable barrier.

Higher speeds of aircraft are not possible with one airscrew, and for this reason the Professor advocates the employment of two contra-rotating airscrews mounted on one shaft.

A New Alfa

THE Alfa-Romeo works at Milan are reported to have developed a new 18-cylinder twin-row radial engine of 1,600 h.p. for take-off, with a fuel of 87 octane. Normal performance at 10,500ft. is said to be 1,600 h.p. Engine capacity is 48·217 litres, swept volume 2.76 litres per cylinder. The engine weighs 2,182 lb., has a diameter of 51.7in. and a length of 65.3in. The new Alfa-Romeo is fitted with a supercharger for 10,500ft. altitude.

FOR FORCED LANDING: Emergency equipment of German Aircraft operating in North Africa. Note the water container and packet with powdered chocolate packed in a pneumatic sleeping bag. Picture on the right shows the iron ration composed of dates, oranges, packet of raisins, sweets, shortbread, biscuits and a cigar. A shot-gun is also said to be carried in case any game is available.

Middle-East Beaufighter Squadron

Glimpses of a Fighter Squadron Equipped with the Hard-hitting Long-range Bristol Beaufighter

(Above) Beaufighter aircrews being briefed for a sortie which may be ground strafing of enemy mechanised transport in North Africa ; a shipping attack in the Mediterranean ; an attack on enemy airfields in southern Europe or any one of a hundred other jobs.

The two views (above and left) show a Beaufighter running up the sleeve valved Hercules engines and taxying out to the take-off point. The Vickers K gun used for rear protection can be seen in the back cockpit. (Centre below) An Indian soldier guards one of the ammunition dumps of cannon shells dispersed on the edge of the airfield.

(Above) An *al fresco* interview with the intelligence officer after returning from an operation.

(Above) The luxury of a permanent mess cannot be expected even in a semi-permanent establishment. Nevertheless, a degree of comfort can be had in the marquee serving as an anteroom.

Counting them in. The squadron padre and doctor watch the return from a sortie.

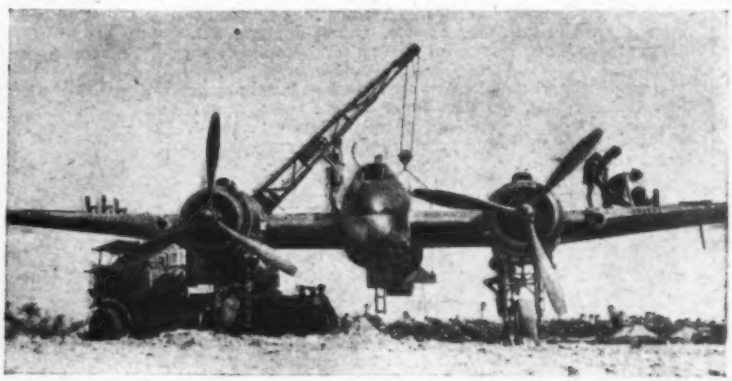
Lunch in the mess. The Commanding Officer of the squadron is seated on the left.

IN the same manner that our single-engined, eight-gun fighters were the most heavily armed of their type in any air force in the world, so, when first in service, the Bristol Beaufighter, with its four 20 mm. cannon and six machine guns, carried nearly double the hitting power of its nearest competitor, the Messerschmitt 110.

The Beaufighter, despite its wing loading of over 45 lb./sq. ft., has proved itself exceedingly adaptable to all sorts and conditions of war service. It has scourged enemy shipping in the North Sea; it has been the mainstay of our night fighter force in defence of Britain, and its range of 1,500 miles enables it to be used across the Mediterranean to attack enemy airfields and installations. At a very early stage in its operational career the Beaufighter was used to attack Catania airfield in Sicily. This was particularly successful, and 34 Macchi C 200 fighters were destroyed without loss

Officially designated a day and night fighter, the Beaufighter has a top speed—with 1,400 h.p. Bristol Hercules II engines—of 330 m.p.h. at 14,000ft. All up weight is 21,000 lb., and over a third of this is represented by disposable load. Rate of climb at sea level is 1,850 ft. per min., and the service ceiling is 28,900ft. It is well armoured and a crew of two is carried.

(Right) A travelling crane holds the Beaufighter's tail in flying position while some overhaul is carried out. This view shows clearly the de Havilland airscrews, the four cannon in the bottom of the fuselage, the four machine guns in the starboard wing and the two machine guns in the port wing.



High-altitude Flight

Part II—Oxygen Supply to Pilots' Pressure Cabins : Some German Designs

By W. NICHOLS, A.R.Ae.S.

HIGH-ALTITUDE flying has become essential in modern warfare, and incidents have already been reported of Ju 86P types being shot down by the R.A.F. at heights between 40,000 and 50,000ft. Aircraft with the highest ceiling are likely to have a tactical advantage, other things being equal, a fact obviously realised by the enemy from the design of the Ju 86 fitted with a pressure cabin for stratosphere flight.

In service aviation there are two main problems associated with high-altitude flight, the human element and the mechanical. As already mentioned, Britain has gone ahead in partially solving the second by the design of the Rolls-Royce Merlin 61, which incorporates a two-speed two-stage supercharger. Research and experiment in pressure cabin design has not been neglected, but so far there are no reports of British aircraft with a pressure cabin flying at high altitudes in this war. Hitherto the crews have used oxygen equipment.

A Water Analogy

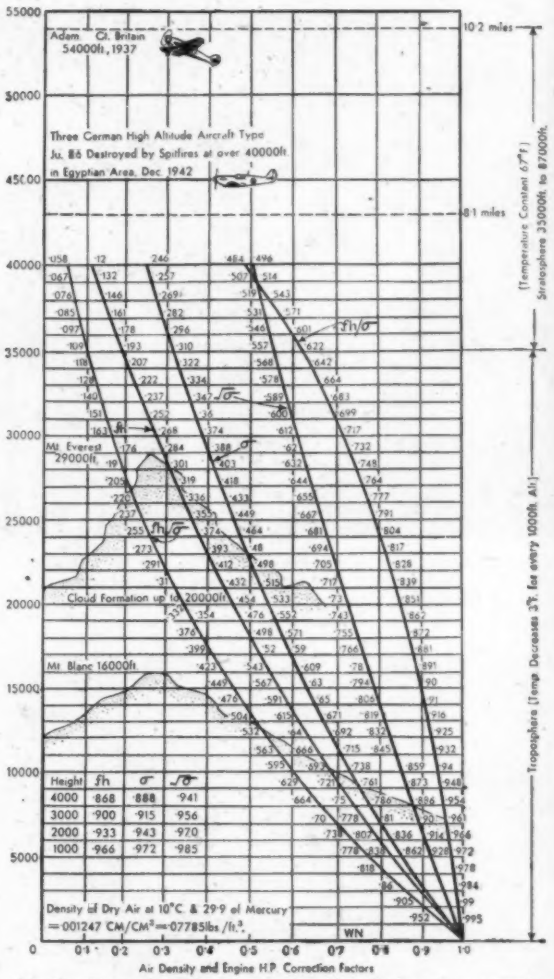
The problem in connection with the human element can be illustrated by assuming a glass of water to be placed in a chamber from which the air has been exhausted. At a barometric pressure equivalent to about 18,000ft. bubbles will rise in the glass. They will become quite numerous at, say, 25,000ft. The dissolved gases are escaping. Exactly the same thing happens, at these altitudes, to the crew of an aircraft, nitrogen escaping from the tissues and bloodstream. This phenomenon is called "aeroembolism," and causes drowsiness, fatigue and impaired senses. At 30,000ft. most pilots would probably become semi-conscious in about 20 seconds. The problem is partially overcome by the supply of oxygen to the crew from the equipment they carry, which serves to restore the crew to normal.

It has been authoritatively stated that approximately 35,000ft. is the limiting altitude that an airman can attain, even when supplied with oxygen, but from reports, R.A.F. fighter-pilots in this war have engaged the enemy at well over 40,000ft., using either their oxygen supply or pressure suit. (A picture of Flt. Lt. Adam in his pressure suit was published on p. 182 of last week's issue.) This indicates the high standard of physical fitness prevailing in this section of the R.A.F. Without pressure cabins this must be near the limit, even for the fittest, due to internal body pressure and external barometric pressure becoming unbalanced.

LAST WEEK'S article dealt with the fundamental problems of flying at great heights. The advantages likely to accrue were indicated, and the mechanical precautions necessary were outlined.

In the present article the author examines the effects of height on the human body, and then passes on to a review of what Germany has done in the way of pressure cabins, remotely controlled guns, etc. For the patent translations we are indebted to R.T.P. of the M.A.P.

Another effect of high altitude on the human body is known as the "bends." This causes temporary paralysis and much pain. Some details published of an oxygen mask used by the American Army Air Force states the flow is controlled according to the barometric pressure, and an exhalation bag is fitted. Only a portion of inhalation goes into the lungs; the remainder fills a cavity about the lungs. Exhalation is into the bag and this oxygen can be used again. It is claimed that the exhalation bag greatly increases the efficiency of the oxygen system.


Adam Of Britain
54000ft., 1937
Three German High Altitude Aircraft Type
Ju. 86 Destroyed by Spitfires at over 40000ft
in Egyptian Area, Dec 1942
Mt Everest
29000ft
Cloud Formation up to 20000ft
Mt Blanc 16000ft
Height
4000 ·868 ·888 ·941
3000 ·900 ·915 ·956
2000 ·933 ·943 ·970
1000 ·966 ·972 ·985
Density of Dry Air at 10°C. & 29·9 of Mercury
=·001247 CM/CM³=·07785lbs /ft.³
WN
Air Density and Engine H.P. Correction Factors
10·2 miles
8·1 miles
Stratosphere 35000ft. to 87000ft.
(Temperature Constant 67°F.)
Troposphere (Temp Decreases 3°F. for every 1000ft Alt.)

Air density and engine h.p. correction factors for normal aspirated engines. Sea level to 40,000ft.

In Germany the development of the pressure cabin for military purposes has received considerable attention, and below some of the more interesting designs are briefly reviewed. There is a tendency, which applies not only to German designs, to construct the pressure cabin for military purposes as a separate unit, and then to either attach or build it into the fuselage proper. A design patented by the Henschel Aircraft Co. consists of a pressure cabin which forms the front part of the fuselage. It is characterised by the fact that the chamber is designed in the form of a stiff box beam which forms part of the aircraft structure. This box beam consists of two lateral walls formed of sheet metal and provided with stiffeners, two longitudinal panels and two bulkhead frames.

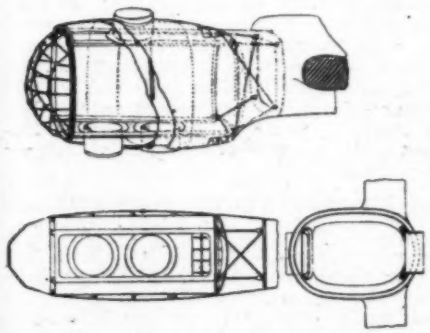
Pressure Cabin Interchangeability

The longitudinal panels form the roof and floor of the chamber respectively; they are in the form of stiff frames provided with the necessary openings for entry, and for the mounting of retractable gun turrets. The bulkheads form the ends of the cabin, the rear bulkhead serving as point

HIGH-ALTITUDE FLIGHT

of attachment for the supporting struts between pressure cabin and main fuselage. The stiffeners for the lateral metal skin of the cabin also act as a support for the outer aerodynamic fairing. One advantage of this system is that aircraft could be designed to be readily adapted for high-altitude service by removing the front portion of the fuselage and substituting the pressure cabin which, as the illustration shows, is hung from the airframe by a structure similar in principle to a radial engine mounting. In addition the power plants could be readily interchanged by a standard installation design which permitted the substitution of engines supercharged for high altitude. Such a scheme might have practical value in wartime.

Another design by the Henschel Co. shows a pressure cabin with a sealed-off tubular passage through which structural members of the wing may pass. The sealed tunnel forms part of the supporting frame of the cabin and encloses either the top or bottom flange of the wing spar, according to the position of the wing, *i.e.*, high or low. Not only does the flange pass through the cabin but, in addition, it is elastically supported, the top boom of the



Henschel pressure cabin, comprising box beam construction. Mounted a la radial engine.

spar being constructed with the sealed tube integral with the cabin. External attachments for the outer spar boom are provided. In a third design (not published) the complete spar for a mid-wing aircraft is housed in a rectangular sealed tube the whole distance through the cabin.

The Focke-Wulf Aircraft Co. uses one or more pressure cabins which are interconnected with airlocks. The flying and engine controls are duplicated and fitted both inside and outside of the cabin. An additional feature is that the pressure and air conditioning of the cabin, and also the air locks, can be controlled from a central station as well as individually.

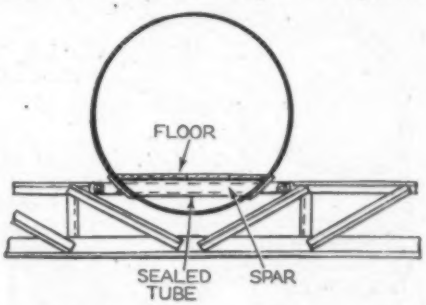
Pressure Cabin for Military Reconnaissance

A scheme by the Dornier Co. has advantages from a military standpoint and comprises a cabin in the shape of a body of revolution which is mounted with its axis *horizontal* in a cut-away portion of the nose of the aircraft. It projects above the back and sides of the fuselage so as to give the occupants a clear view along it towards the rear and also vertically downwards on each side.

To maintain its advantages in service the cabin would require numerous transparent panels. With a pressure cabin these are usually arranged in the form of layers of glass and Perspex of suitable thicknesses, with a space

Two or more pressure chambers with intermediate airlocks—Focke Wulf system.

between them. If numerous they would add considerable weight, and in addition would necessitate a discontinuity of section in the cabin shell. As a result the structure would have to be considerably reinforced at these points, adding still further to the structure weight. The possible



A sealed tunnel houses the spar through the cabin in this Henschel design.

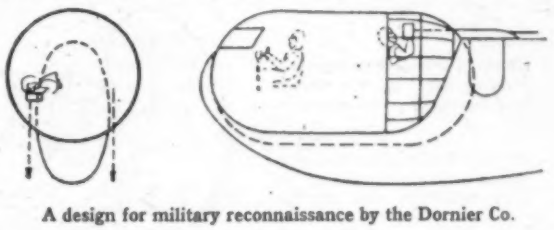
source of leakage from such panels might become a problem in service.

A double-walled pressure cabin design by the Junkers Co. is characterised by the sections forming the internal skin being jointed by overlap riveting to withstand tension, while the outer skin sections are riveted from one side only and provided with special tension bars located close to the skin and anchored to the front and rear frames of the cabin.

Junkers Construction for Double-wall Cabin

The sections of the outer skin have external flanges which are riveted or screwed together. Tension members are also attached to the bulkheads and serve to reinforce the top and bottom ends of the cabin. The upper, lower and end portions of the cabin are domed, but the fundamental principle of design for a pressure cabin has been ignored inasmuch as the sides are flat. The constructional features appear to be intended as a means of departing from the usual circular elements for the cabin if, for any reason, it becomes necessary to do so. In this respect the method of construction is clever and appears practical.

Typical of recent designs by the Messerchmitt Co. is the custom to provide a continuous wing spar, or spars, extending over the span of the centre section. A method

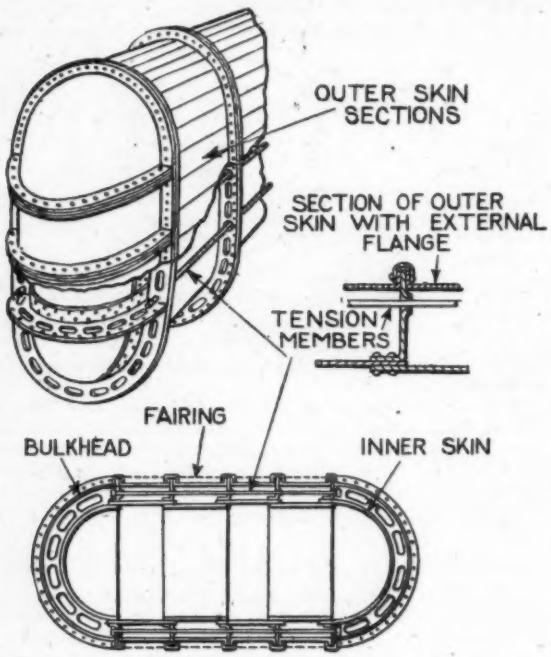


A design for military reconnaissance by the Dornier Co.

used when it is desired to incorporate a pressure cabin other than of circular section is to reinforce the lateral wall of the cabin against the internal pressure by girders in the form of a "T" section. External to the fuselage the web of these girders is formed by the wing covering. Inside the fuselage the wing covering is removed, and the flange is formed by the closed wall of the cabin. Stiffeners run between web and flange at the transition points. To depart from a circular cross section for a pressure cabin usually results in excessive structure weight to provide the necessary reinforcement. It would appear that in this Messerschmitt design the structure weight would be somewhat heavy in comparison with the better method of a circular section used by the Henschel Co., described earlier.

Of considerable interest, mainly due to the basic principles involved, is a German design by F. Mannebach. The inventor describes four possible methods of operating armament mounted externally. Two of the arrangements are illustrated. The first provides for a cylindrical pressure cabin which houses the gunner. The gun is mounted

HIGH-ALTITUDE FLIGHT

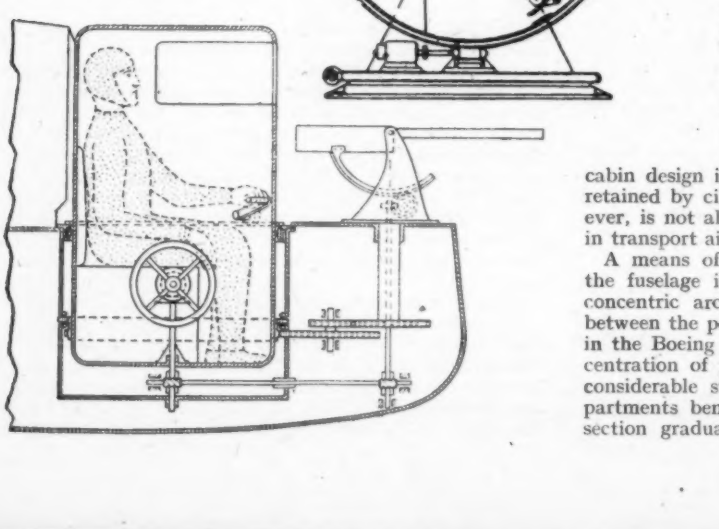


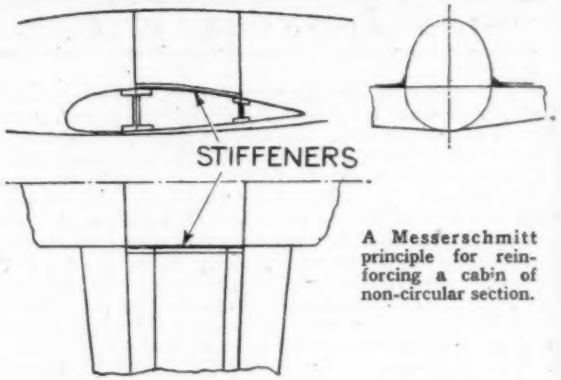
Departing from the circular element in cabin design. Junkers double-wall cabin.

externally and is remotely controlled and sighted. The second arrangement appears to be an improvement. In it the cabin can be rotated about a vertical (and probably also a horizontal) axis, the motion being communicated to the gun. In the third arrangement the gun is mounted on the cabin, above the gunner, thus forming a single structural unit which can be rotated about a vertical and/or horizontal axis. The cylindrical chamber takes a form slightly different from that of the previous design. The diameter is abruptly reduced to provide a small chamber for the gunner's head, and upon this chamber the gun is mounted.

(Right) Final development dispensing with remote control and the cabin power-operated.

(Below) The original design by Mannebach for mounting the guns externally and remotely controlled.





A Messerschmitt principle for reinforcing a cabin of non-circular section.

The final development, as illustrated, provides for the gun to be partly or entirely operated by hand, the necessary controls passing through stuffing glands in the walls of the cabin to points where they are within easy reach of the gunner. The pressure chamber varies between a circular and oval section, and with the gun can be rotated simultaneously about a vertical and/or horizontal axis. It is power operated, apparently by an electric motor. This arrangement seems to be worthy of still further development for installation in the nose or tail of an aircraft for high-altitude operation

Pressure Cabin Design : The Double-arc Section

A pressure cabin of interesting design has been devised by the *Deutsche Versuchsanstalt für Luftfahrt E.V.* The outer skin is mainly under tension from the internal pressure, as indicated by the fact that all reinforcements of the cabin, such as bulkheads, etc., are also designed to withstand tension loads. All loads inside the cabin are suspended in such a way that they do not stress the cabin walls. The main idea behind this scheme apparently is the incorporation of a pressure cabin with a fuselage built upon the girder principle. The illustration shows the pressure cabin suspended in the fuselage.

A further claim is that the surface of the cabin forms a shell for each point of which the principal stressed-skin equation

$$1 = s\left(\frac{\sigma x/\rho i}{\gamma x} + \frac{\sigma y/\rho i}{\gamma y}\right)$$

is satisfied, the radii of curvature being so chosen that the normal stresses σx and σy are purely tensile, and where s = thickness of cabin walls and ρi = internal pressure. A cupola or dome is fitted instead of the normal wind screen. Discontinuities in sections due to this and other fittings are bridged by special tension bands which are attached separately to the pressure cabin proper.

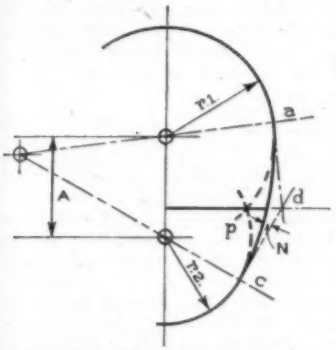
To achieve the weight economy in pressure cabin design it is advisable that the internal pressure be retained by circular elements. The complete circle, however, is not always ideal for space distribution, especially in transport aircraft.

A means of obtaining a greater depth than width in the fuselage is to use a section consisting of two non-concentric arcs, the floor serving as the stay member between the points of intersection. Such a section is used in the Boeing Stratoliner. This section permits of a concentration of payload near the c.g. of the aircraft since considerable stowage space is available for freight compartments beneath the floor. Approaching the tail this section gradually develops into an inverted pear shape

HIGH-ALTITUDE FLIGHT

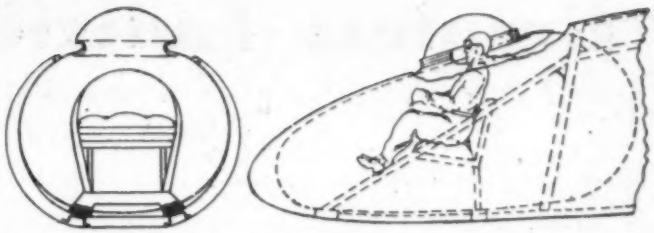
which from wind-tunnel tests is quite efficient aerodynamically. In the illustration the two arcs have been faired in to provide greater floor width.

This arrangement for the cabin section represents a greater weight expenditure, since it involves the support of a certain portion of the load by bending. The bending moment at any point p in the region shown is $(r_1 - r_2)$ P.N., where P is the pressure differential and N the normal distance of p from the tangent line c d. A modified equation holds for the upper portion of the arc, and in all cases the tension load in the floor = P.A. The advantages of these sections decrease in comparison with a circular section as the size of the aircraft increases. The circular section should find favour in very large aircraft, but where the overall width is under twelve feet the double-arc section will be advantageous in providing greater depth.

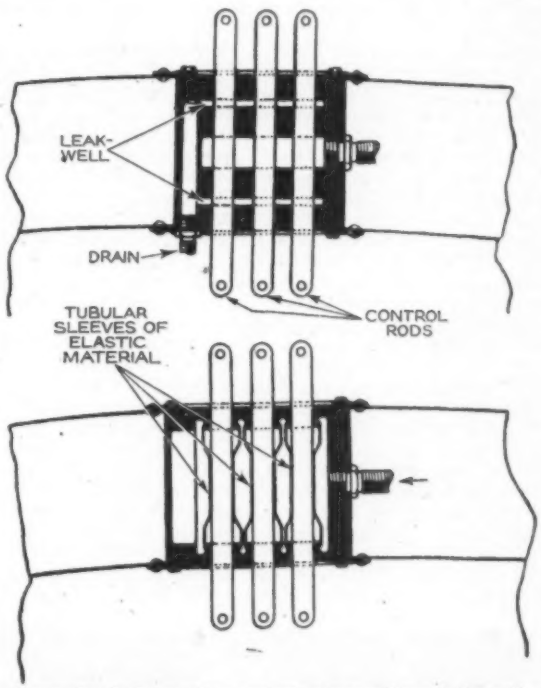


Data for calculating stresses in double-arc section cabin.

Passing control rods through the walls of the pressure cabin demands ingenuity and careful design. The arrangement by the Henschel Co. is, therefore, interesting. The scheme provides for a push-pull control via a packing gland fitted where the control rods pass through the cabin walls. Tubular sleeves surround an appreciable length of the rods and have their ends attached to the wall of the pressure chamber. They are, of course, made of elastic material. These elastic tubes operate in the manner of bellows and prevent leakage from the cabin. A second scheme dispenses with the tubular sleeves, but the gland incorporates a leak-well and drain, leakage past the joint entering the wall to return via the drain.



D.V.L. tensioned skin cabin mounted in a girder fuselage.



Preventing leakage where control rods pass through the cabin walls. Henschel method.

BRITISH OVERSEAS AIRWAYS' WAR RECORD

More than a Dozen Different Types in Service

SOME striking figures have just been issued by British Overseas Airways. They show that during 1942 their landplanes and flying boats flew about 10,000,000 miles in an aggregate flying time of about 67,250 hours, and carrying 43,000 passengers, 950 tons of mails, and 2,250 tons of freight.

This is a distinctly creditable achievement considering that aircraft have frequently to fly through war areas and that the machines are unarmed.

Expressed in ton/miles, the capacity handled during the year amounted to 21,600,000, compared with 12,587,294 ton/miles in 1941 and 8,674,972 ton/miles in 1940. The total passenger/miles flown were approximately 91,000,000. The nature of the Corporation's wartime activities is shown by the following list of the routes at present in operation.

Flying Boats:

Boeing 314s: Three services every thirty days, Baltimore-United Kingdom via Bermuda and Lisbon; Lagos-Baltimore via South Atlantic; Lagos-United Kingdom.

Catalinas: United Kingdom-Lagos.

Short "G" Class: Varying frequency United Kingdom-Foynes and United Kingdom-Lisbon.

Short "C" Class: Durban-Calcutta and Cairo-Lagos.

Landplanes:

"F" Class (Frobisher) and Whitleys: Varying frequency West of England-Eire (to connect with P.A.A., A.E.A. and Boeing Services).

North Atlantic Return Ferry: Liberators: Several services weekly Montreal-United Kingdom.

Liberators: United Kingdom-Lagos and United Kingdom-Lisbon.

Douglas D.C.3s: United Kingdom-Lisbon. Several services a week.

Lockheed 14, Lodestar or Hudson: Cairo-Teheran, Teheran-Habbaniyeh, Khartoum-Nairobi, Asmara-Addis Ababa, Cairo-Asmara, Asmara-Karachi.

"E" Class (Ensign): Khartoum-Lagos. Varying frequency Khartoum-Asmara.

Wellingtons: Cairo-Karachi.

Lockheed 10A, 14, Lodestar, Hudson or Wellington: Varying frequency between Cairo and Western Desert.

A Madagascar service is now in operation between Kisumu and Diego Suarez via Mombasa, Dar-es-Salaam and Lindi and Pamanji. The foregoing list does not include certain services which are not mentioned for security reasons, and frequencies of certain services are omitted for similar considerations.

"Greatest Individual Effort"

Commonwealth Air Training Plan and Its Importance to Post-war Civil Flying

THE post-war value of the Commonwealth Air Training Plan in providing trained pilots and crews for civil air transport was mentioned by Air Chief Marshal Sir Arthur Longmore when he spoke to the Royal Empire Society, in London last week, on his recent visit to Canada during which he made a 12,000-mile coast-to-coast tour of the Dominion's air training schools, travelling mostly by air.

Viscount Bennett presided and, stressing the importance of the post-war continuance of close relations between the R.A.F. and the R.C.A.F., expressed the opinion that there was too much thinking on international lines these days; what was needed was to think on Empire lines, if we hoped to maintain our position as a leading power after the war.

Viscount Trenchard, in a vote of thanks to Sir Arthur Longmore, said he felt that the air training scheme was the greatest individual war effort of any nation in the world.

The most important point made by Sir Arthur in the course of his address was that the air training scheme now being operated by Canada would ensure that a supply of trained air crews was available after the war to man our airliners; but it was important that we did not have to wait too long for the aircraft. He had crossed the Atlantic both ways in a Liberator, and improvised aircraft did not provide luxurious travel. They flew high to avoid icing and oxygen was necessary; it was also extremely cold.

During his tour he flew mainly in T.C.A. aircraft, which were mostly Lockheed Lodestars. They were centrally heated, had very comfortable, adjustable seats, and most attractive hostesses. Night air travel in comfort, with the thought of a snow-covered wilderness far below, was in itself a thrill, and as an example of this Sir Arthur mentioned that they took off from a floodlit airfield at Toronto at 10.30 p.m. and, after two stops *en route*, reached Winnipeg 5½ hr. later. Unfortunately, he had crossed the Rockies just before daylight and so had missed seeing dawn over the mountains, which was a most wonderful sight.

The schools he had visited during his aerial tour were mostly training air crews and were of two types; those staffed by the R.C.A.F. and those with R.A.F. staffs. In spite of cold and snow, flying instruction went on day and night except when interrupted by blizzards or heavy falls of snow. They had two methods of dealing with snow on the runways, one being to blow it off with special machines and the other to roll it flat and hard, so they were rarely out of action through snow.

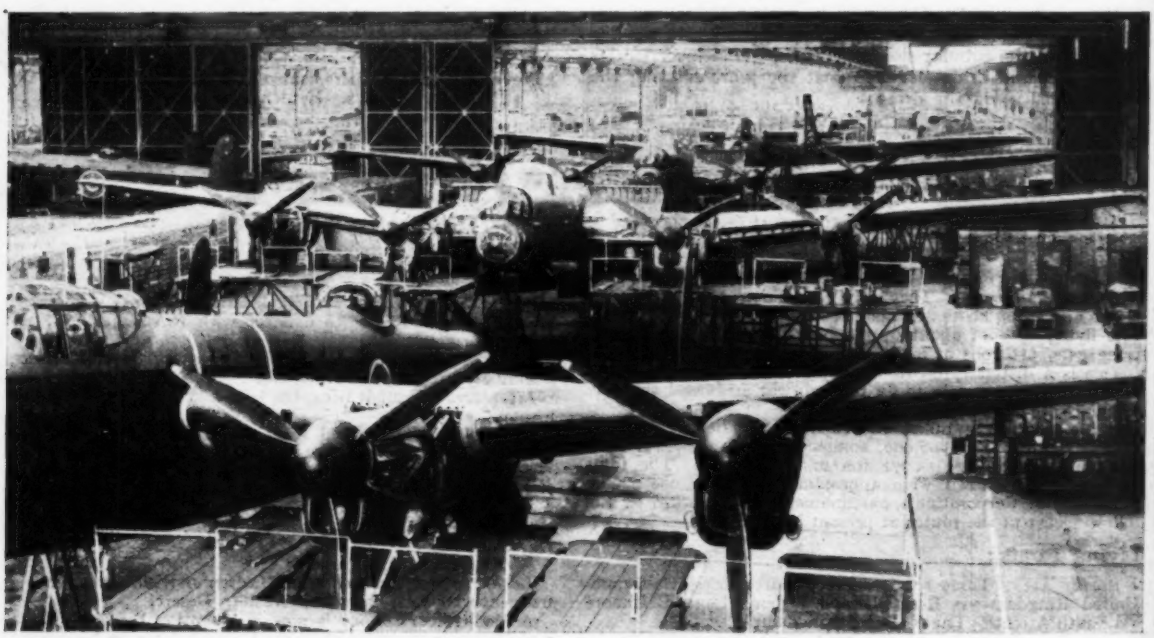
Snowed-up Runways

The station buildings, nearly all wood, were built in an astonishingly short time, and the hangars, which were sufficient to accommodate all the aircraft (sometimes over 100), were warm and brilliantly lit so that the maintenance crews could work in comfort both day and night. Flying figures returned at these schools were quite fantastic and in one case reached 1,000 hr. a month.

After the war, said Sir Arthur, international air legislation must include the provision that all aircraft, whether service, commercial or private, must have radio equipment, and there must be a common language to talk on it. There could be no question of amateurs without radio cruising at will about the sky to the danger of airliners.

But no one could tell, yet, whether the nations would accept the policy of freedom of the air which was not mentioned in the Atlantic Charter.

"It is curious that freedom of the air was not included in Article 7 of the Charter," said Sir Arthur, "which refers specifically to travel on the high seas and the oceans without hindrance," and he added that if it came to bargaining for the operation of air transport lines, then Canada was in a strong position vis-a-vis the United States.



AVRO AVALANCHE. A particularly impressive view of the production line in a factory turning out Lancaster bombers for the R.A.F. The March issue of our associated journal, *Aircraft Production*, includes the third instalment of a review of the processes employed in Lancaster production.

CORRESPONDENCE

The Editor does not hold himself responsible for the views expressed by correspondents. The names and addresses of the writers, not necessarily for publication, must in all cases accompany letters.

CONTROVERSIAL MAXIMUM SPEEDS

Apparent Discrepancies in Figures

AS I am naturally interested in the maximum speeds of all types of aircraft, I cannot help noticing the discrepancy, occurring at different times in several magazines, of "official" and "approximate" maximum speeds of various machines at their rated heights.

Could any reader inform me if the speeds quoted are the indicated air speed, the corrected air speed, or true air speed taken from the air-speed indicator, or the speed relative to the ground?

"SQUITA."

UNSUNG WORTHIES

Backbone of the Ground Staff

WE read with very much pleasure the reference to "unsung worthies" in *Flight* of February 4th and also of February 11th. We share this opinion with many more ground crew, especially the fitters and riggers, who are the backbone of the ground staff.

We don't want praise for the work we do, just a little recognition in the form of a badge to show we *do* do something of importance.

Before the R.A.F. Regiment was formed they were ground gunners, and everybody knew it. Why? Because they had a badge. Even now they have a massive shoulder flash, and the wireless mechanics have a badge. So why not the hard workers of the Air Force?

FOUR VERY PUZZLED GROUND CREW.

An Armourer's Life is Dull

MAY I, as a humble member of one of the ground trades of the R.A.F., express my complete agreement with "An Admirer of the Ground Crews," whose letter appeared in *Flight* of February 11th, 1943.

In my own trade (armourer) life is very dull and boring, to say the least. Practice bombing and air firing—that is all we do. We never have the chance to bomb-up for raids on Berlin and other large enemy towns, and how our hearts ache to be able to strike a real blow at our foes.

In most cases our big four-engined modern bombers remain mysteries to us, unless we are lucky enough to be able to look over one when we very rarely have one land on the airfield.

We often read the advertisements in the daily newspapers calling for men to join the R.A.F. as tradesmen. "Come and help bomb Germany' is one favourite slogan. Oh! Just give us the chance.

Somehow though, we manage to carry on through thick and thin, and there is always just a slight chance of being posted to an "Ops." squadron.

However, together with flight "mechs.," electricians, instrument "bashers" and all the other ground crews, we turn out the crews to help smash the Axis partners.

Up armourers and at 'em!

L.A/C. ARMOURER.

EX-R.A.F. PILOTS

Their Post-war Chances

A WORD or two from one who has recently joined the ever-increasing ranks of ex-R.A.F. pilots. I should like to know what our position is in the flying world, i.e., those of us like myself who were discharged from the Service due to ill health and thus no longer fit under R.A.F. standards.

Many of the above fellows no doubt would like to take up flying for pleasure or business after the war, and at the moment, apart from one's discharge papers, which only give rank and R.A.F. trade, an ex-R.A.F. pilot has nothing whatever to show what aircraft he is qualified to fly or the number of hours flown or the standard reached at the time of discharge.

His log book, which is considered a secret document, is retained by the Service, so that apart from discharge papers (he may also have kept his wings as a souvenir) he has nothing to prove his flying abilities. Surely, the R.A.F. "wings" are equivalent to a pilot's licence of some sort, and therefore an ex-Service pilot is eligible for a civilian licence?

I, and I am sure many others, would like to know if the Air Ministry have any provision to meet the cases of airmen like myself. After all, when the war is won we would like a share in a peaceful sky where our brothers fought so gloriously.

"STILL PROP."

STORMOVIKS IN ACTION

Interesting Shots in Soviet War Film

THERE are some interesting shots of the Red Air Force in action in the new Soviet film "One Day of War," now showing in London. The film was made by 160 camermen in the course of one day in June, 1942.

Among the most interesting sequences is an attack on a Fascist tank unit by a formation of Stormoviks carrying the Russian rocket bomb. The bombs are released when the formation is flying very low and almost level; this disposes of the suggestion that the Stormovik is a dive bomber. The bombs are apparently fired in pairs, and although the departure of the bomb is too rapid to be seen (except by an examination of the film itself) the streaks of the rocket exhaust are clearly seen.

Many other shots of Russian aircraft will be of interest to readers of *Flight*, and the whole film is a vivid reminder of the total war now being fought on the Eastern Front.

GORDON RONSON.

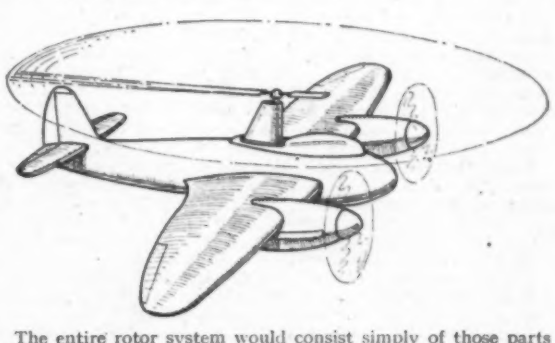
BOMBER ESCORT

A Variation on the Slip-wing Theme

THE recent correspondence in your columns on this subject may incline some of your readers to the view that most avenues along this line have already been explored—and found wanting. Be that as it may; the field of invention in connection with prolonging fighter escort for the bomber is by no means exhausted. The auxiliary jettisonable fuel tank has almost doubled the useful range of fighter aircraft so fitted, since the auxiliary tanks increase the fuel capacity by approximately 100 per cent.

Let us now approach the subject from a strictly aerodynamical point of view, by fitting an auxiliary jettisonable rotor (of the single-bladed, counterbalanced type) to fighter aircraft. Preliminary calculations show that for an additional all-up weight of some 70 lb. a further 100 per cent. can be added to the fuel capacity, making 200 per cent. in all over the original tankage of the aircraft.

The accompanying sketch shows the scheme more clearly than folios of description. The main idea is, of course, temporarily to increase wing area, and consequently load-lifting capacity at take-off, and for the early stages of the flight. For this scheme permanent extra tankage would have to be provided, preferably within the wing structure, the auxiliary jettisonable tanks being, of course, retained.



The entire rotor system would consist simply of those parts shown in the sketch and comprise merely a short streamlined mast surmounted by a ball-bearing rotor head on which is mounted a single-bladed, counterbalanced rotor, the single blade of which is so constructed as to be jettisonable at the will of the pilot.

Starting up the rotor (preliminary to take-off) is effected by external power not carried by the aircraft, whilst braking and stopping the rotor is effected aerodynamically. The rotor is, of course, wind-driven in flight. When stopped the rotor blade trails in the slipstream and is jettisoned as and when

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desired, being carried away clear of the aircraft in the slipstream.

As a guide to weight, some years ago the writer was associated with the design of a three-bladed rotating wing aircraft of some 26ft. rotor diameter, the weight of each individual blade being but 15 lb. only.

Increased wing area (as represented by the rotor) will, of course, reduce the speed of the fighter, but not below that necessary to keep pace with the average heavy bomber. Should speed be desired at any time the rotor blade is always jettisonable.

Due to the employment of the auxiliary rotor, complications will arise in connection with aircraft stability, but these have been carefully examined and are by no means insurmountable.

Incidentally, a jettisonable rotor of the type described herewith might find a sphere of usefulness in connection with the vexed question of "assisted take-off." E. V. HAMMOND.

FIGHTER SPEEDS

Other Factors to be Considered

IN answer to Mr. Willey's query in your issue of February 4th, may I, as one of those who helped to build the S.6 racing seaplanes, endeavour to explain the *apparent* lack of progress since 1931? First, the S.6B:—

(*a*) The Schneider Trophy race was won at, I believe, 348 m.p.h., and *not* 407.5 as stated; the latter speed was achieved in a successful attempt to break the existing speed record, and the engine was specially boosted for this effort.

(*b*) The S.6B was just a racing shell and carried the barest instrument equipment and only sufficient fuel and oil for about 45 min. flying.

(*c*) The engines were only built to last for a few hours' running, after which period they would need complete overhaul.

(*d*) The cooling was by means of surface radiators—far too vulnerable for operational flying.

(*e*) These machines could only be flown by extremely skilful pilots, and, apart from their speed, their performance in manœuvrability, ceiling, and available load would leave much to be desired in a fighter.

Now compare the modern fighter:—

(*a*) Anything up to 50 m.p.h. more than the average speed of the S.6B over the Schneider Trophy course.

(*b*) Complete flying and navigational equipment, including oxygen gear, two-way radio, navigation lights, landing lamps, blind flying panel, reflector sight, etc., and sufficient fuel for 1½-2 hours' high-speed cruising.

(*c*) High degree of engine reliability with normal service maintenance.

(*d*) Radiators reduced to smallest possible size, and self-sealing fuel tanks.

(*e*) Aircraft capable of being flown by average Service pilot with manœuvrability, climb, and ceiling far beyond anything possible in 1931. Available load includes machine guns, cannons, ammunition, armour plate, armoured windscreen, etc., and all this on about 1,300 h.p.

No progress since 1931, Mr. Willey?

G. W. GREEN.

Effects of Torque Reaction

IN *Flight*, February 4th issue, C. G. Willey compares the performance of the S.6B of 1931 with that of modern fighters and wonders at the apparent non-improvement of the breed.

The S.6B was, of course, a racing machine at racing pitch in the same way that Austin Seven cars, with a cruising speed of 40 m.p.h., were tuned up by experts to treble that speed on the race track.

Another point is that the S.6B utilised the fuselage surface as a very efficient cooler (and what wouldn't one bullet have done for that?), whereas modern coolers are more localised and offer much more resistance owing to their protrusions.

Owing to the terrific torque reaction, the S.6B had to take off across the wind, otherwise one float tended to dig in while the other tried to soar when full power was applied. The same principle affects modern single-engined high-powered fighters, often preventing use of full power at take-off.

My own idea of a really fast machine comprises a Sabre engine lying on its side across a shallow fuselage, with the cylinder heads towards the leading edge of the wings, in which are situated the cooling inlets. Hollow shaft extensions, through gears, drive two oppositely rotating airscrews. The absence of bulky engine nacelles and radiator scoops should contribute materially to a really high performance.

The torque reaction in such a machine would tend to lift the tail into flying position, but would be controlled by the tail when flying. H. M.

Book Reviews

The Fleet Air Arm. By John Moore. Chapman and Hall. 5s. net.

AT a time when the equipment of the Fleet Air Arm is rather a burning question, the publication of a book on the subject by a pilot in that Service, especially by one who was a successful author before the war, is an event to be welcomed. This is, as one would expect, a very well-written book, and if some of the stories have already been told (e.g., the sinking of the *Bismarck* and the loss of H.M.S. *Ark Royal*) this author adds to those epics certain details which were not generally known before. He tells us that when H.M.S. *Victorious* went out to chase the *Bismarck* she had a crew that was not yet used to her and a scratch collection of aircraft hurriedly assembled, while she had not completed her trials and had never run her engines at full speed.

Going back to the earliest air blow of the war, one remembers that when the R.A.F. bombed Wilhelmshaven and Brunsbuttel (reconnaissances, the author calls the flights) it was officially stated that special observers had been chosen to guide the aircraft. From this book we learn that those observers were naval officers of the Fleet Air Arm.

On the equipment of the Fleet Air Arm Mr. Moore is frank. The fighters in 1939 "looked horribly out of date by comparison with the R.A.F.'s Hurricanes and Spitfires"; the Swordfish (known as "Stringbags") and the "old bumbling Walrus" (christened by the F.A.A. the "Shagbat") "were like brontosauri that had outlived their day and strayed into the age of the sabre-toothed tiger." Yet he never complains or says that the F.A.A. had been let down. Some critics have said that the Admiralty was to blame, and had no clear ideas about aircraft. This author reminds us that in 1918 when the R.A.F. was formed, the Navy lost 5,000 officers and 50,000 ratings. Is it much wonder that the Admiralty should have been left groping when all its air experts had been taken from it?

The most valuable features of this book are the author's summaries on things in general. One trenchant remark is: "Writing as a pilot, I would say that the observer's responsibility, in anything other than fighters, is about twice as heavy as that of the man who flies the aeroplane." His comments on F.A.A. duties in action are sensible, and the most striking opinion expressed in the whole book is the conclusion about the Battle of Matapan: "It would be nonsense to say that H.M.S. *Formidable* won the battle: but it would be true, I think, to say that without her and her aircraft it could not have been won."

The Campaign in Greece and Crete. H.M. Stationery Office. 6d. net.

THIS little brochure is one of the series "The Army at War," and, truth to tell, it is rather disappointing. It was inevitable that Army writers should have been entrusted with the telling of the two stories, and yet the air side had so much bearing on the result, especially in the Crete campaign, that the reader naturally expects some well-considered reflections on that side, and he does not get them. The Australian General, Sir Thomas Blamey, made some acute observations on the effects of German bombers at the end of the Greek campaign which might well have been quoted. He said that the bombing, though irritating, did very little damage.

The struggle for Crete was still more a matter of German air power working with troops who fought on the ground, but the writer of this section (who was different from the author of the first part) evidently considered it his duty to devote most of his attention to the fighting on the ground after the airborne Germans had landed. Of course, he had to mention the use of air-landing troops and parachute troops, but he contents himself with a recital and hardly ventures to draw any lessons from the events. The brochure is, therefore, chiefly useful as a record of facts.

SERVICE AVIATION

Royal Air Force and Fleet Air Arm News and Announcements

ICING AT ZERO FEET : A line of aircraft, at a Ferry Command station in Newfoundland, waiting to be flown to Britain

Awards

Fleet Air Arm

THE KING has been graciously pleased to approve the following awards :—

For skill, bravery and sustained resolution in many air attacks against enemy submarines and E-boats in the Mediterranean :—

DISTINGUISHED SERVICE CROSS.

Temp. Sub. Lt. (A) W. STUART, R.N.V.R.
Temp. Sub. Lt. (A) V. M. LANGMAN, R.N.V.R.
Temp. Sub. Lt. (A) P. H. WOODHAM, R.N.V.R.
Temp. Sub. Lt. (A) R. J. BABINGTON, R.N.V.R.

Royal Air Force

THE KING has been graciously pleased to approve the following awards in recognition of gallantry displayed in flying operations against the enemy :—

DISTINGUISHED SERVICE ORDER.

Act. Sqn. Ldr. R. H. GIBBES, D.F.C., R.A.A.F., No. 3 (R.A.A.F.) Sqn.—This officer has completed many operational sorties, in which he has destroyed at least nine enemy aircraft and damaged several others. On one occasion he led a small force on a long-range expedition to reconnoitre and attack an enemy airfield. Owing to his excellent leadership, seven enemy aircraft were destroyed on the ground. During the engagement one of his pilots was forced to land his aircraft. Sqn. Ldr. Gibbes immediately landed as near to him as possible, and, after waiting some time for his comrade, flew off with him. During the take-off a wheel was knocked off the aircraft, but on reaching base Sqn. Ldr. Gibbes effected a masterly landing, causing only slight further damage to his aircraft.

Wing Cdr. R. C. PORTEUS, No. 6 Sqn.—This officer has been in command of his squadron since its arrival in the Middle East, and has displayed great personal skill and courage during numerous operations against enemy transports. He has been successful in destroying, in the course of nine sorties, five enemy tanks, seven lorries, and two troop carriers in addition to other transports.

Act. Wing Cdr. J. D. WARNE, D.F.C., No. 148 Sqn.—This officer assumed command of 148 Squadron at a time when the enemy was advancing. Wing Cdr. Warne was faced with the task of accomplishing an immediate move backwards whilst maintaining a maximum operational effort. This was satisfactorily achieved, and subsequently during the El Alamein battle, Wing Cdr. Warne did particularly fine work in maintaining a high state of aircraft serviceability. Whilst the squadron has been moving forward he has displayed fine qualities of leadership, initiative and organisation.

BAR TO DISTINGUISHED FLYING CROSS.

Act. Flt. Lt. F. A. O. GAZE, D.F.C., R.A.F.V.R., No. 616 Sqn.—Since June, 1942, this officer has completed a large number of sorties and has destroyed at least two enemy aircraft. By his high skill and fine fighting spirit Flt. Lt. Gaze has set an admirable example.

Act. Sqn. Ldr R. P. BEAMONT, D.F.C., No. 609 Sqn.—This officer is an exceptionally skilful and courageous leader. Recently, during a period of five weeks, his squadron has damaged 22 locomotives and rolling stock, and destroyed at least four Fw 190s; 12 of the locomotives were damaged by Sqn. Ldr. Beamont.

Flt. Lt. M. H MACFARLANE, D.F.C., No. 30 Sqn.—In the course of numerous operational flights, including raids on Germany, enemy-occupied territory and targets in the Middle East, Flt. Lt. MacFarlane has maintained an excellent standard of courage and devotion to duty which has had an inspiring effect on his squadron.

DISTINGUISHED FLYING CROSS.

Act. Sqn. Ldr. G. M. ALLCOCK, No. 214 Sqn.—This flight commander served with a transport squadron in the Middle East, and since his return to this country has taken part in a number of night sorties against Germany and Italy. One night in December, 1942, he was detailed to attack Duisburg. While over the target area his aircraft was attacked by a Ju. 88. During the ensuing engagement the bomber sustained damage and three members of the crew were wounded. Undaunted, Sqn. Ldr. Allcock continued and bombed the target. On his return flight the port inner engine caught fire. Despite the crippled state of his aircraft and the grave possibility of the fire spreading, and with both rear guns out of action, Sqn. Ldr. Allcock flew the bomber safely back to base.

W/O. A. R. NOSEDA, R.A.A.F., No. 105 Sqn.—In December, 1942, W/O. Noseda was pilot of one of a force of aircraft engaged in a low-level daylight attack on a target in North-West Germany. During the operation, which was executed at a height of 1,000 feet, the leading aircraft was damaged by the intense air-aircraft fire and lost speed owing to failure of one of its engines. Disdaining the prospect of attack by enemy fighters, W/O. Noseda reduced the speed of his own aircraft and escorted his leader safely to base.

Act. Sqn. Ldr. H. J. L. HALLOWES, D.F.M., No 165 Sqn.—Sqn. Ldr. Hallowes is an outstanding and relentless fighter. He has destroyed 19 and damaged other enemy aircraft. His high skill and unswerving devotion to duty have set an example in keeping with the highest traditions of the R.A.F.

Sgt. H. W. Gough, No. 149 squadron, who has been awarded the D.F.M. He, with Sgt. Hyder, P/O. Skinner, Sgt. Cameron and F/O. Royde made up the aircrew captained by the late Flt. Sgt. Middleton when the latter was awarded the V.C. All have been decorated.

Act. Flt. Lt. R. A. ELLIS, R.C.A.F., No. 412 (R.C.A.F.) Sqn.—This officer has taken part in 58 sorties over enemy territory. On one occasion, in October, 1942, Flt. Lt. Ellis assisted in damaging five locomotives. He has shared in the destruction of one enemy aircraft and damaged several more.

F/O. C. LANGLEY-RIPPON, R.A.F.V.R., No. 25 Sqn.—This officer has completed 48 sorties, involving attacks on airfields, industrial targets and trains. Throughout, he has displayed great keenness, combined with high navigational ability which has set a praiseworthy example.

P/O. D. G. MERCER, R.A.F.V.R., No. 122 Sqn.—This officer, who had participated in 46 sorties, has led his section, and occasionally the flight, with skill and courage. He has destroyed three enemy aircraft, one motor torpedo boat, and shared in the destruction of two other motor torpedo boats.

Act. Flt. Lt. D. O. CUNLIFFE, R.A.F.V.R., No. 5 Sqn.—This officer has completed numerous sorties, involving long flights over wild and mountainous country during the monsoon season. At Kalewa he made numerous attacks in the face of heavy anti-aircraft fire. On one occasion in September 1942, he dived from 6,000 to 200 feet, in the face of heavy fire from several enemy gun positions, and silenced one of the guns.

F/O. W. H. ROBINSON, D.F.M., No. 7 Sqn.—One night in December, 1942, this officer was the engineer of an aircraft detailed to attack Munich. During the return flight the aircraft was attacked by an enemy fighter. The fuselage, tailplanes and port wing were hit by cannon and machine gun fire, and the fuel cock control cables to the port tanks were severed. Displaying great skill and perseverance, F/O. Robinson kept the engines functioning while tracing the damaged cables and repairing them sufficiently to ensure an adequate supply of petrol for the remainder of the flight. He then made a thorough search of the interior of the aircraft and extinguished a small fire which was smouldering among the engine covers.

Over 93 per Cent.

Flt. Lt. W. A. G. CONRAD, R.C.A.F., No. 274 Sqn.—The sound judgment and exceptional efficiency displayed by this officer have contributed greatly to the successes recently achieved by his squadron. On one occasion, whilst in co-operation with a South African squadron, fifteen Ju 87s, strongly escorted by Messerschmitts, were intercepted, and as a result of the brilliant leadership displayed by Flt. Lt. Conrad, his squadron was able to contain the escort whilst fourteen of the enemy were destroyed. He has been personally responsible for the destruction of four enemy aircraft.

Act. Sqn. Ldr P. F. DEVENISH, R.A.F.V.R., No. 260 Sqn.—Both in this country and the Middle East this officer has led his squadron with conspicuous succes in fighter-bomber sorties, bomber escort flights and fighter sweeps, and has throughout displayed exceptional keenness and devotion to duty.

Flt. Lt. H. H. BEALE, R.N.Z.A.F., No. 104 Sqn.—This officer has displayed great determination in getting to grips with the enemy on all possible occasions, and has been instrumental in raising the standard of bombing efficiency in his squadron to a high level. He gave evidence of courage of a high order when he drove a car up to a blazing aircraft which had crashed and then succeeded in saving a lorry near by just before the bombs exploded.

Flt. Lt. G. C KEEFER, R.C.A.F., No. 274 Sqn.

—This officer has participated in numerous operational attacks, in the course of which his determination and tenacity have resulted in twelve victories for his squadron, while many enemy aircraft have probably been destroyed or damaged.

Act. Flt. Lt. A. D. FLECKER, R.A.F.V.R., No. 252 Sqn.—This officer has at all times proved himself to be an exceptionally able pilot. He has participated frequently in attacks on enemy shipping, and in the course of his tour of duty with this squadron has destroyed four enemy aircraft.

Act. Flt. Lt. W. JOHNSON, R.A.F.V.R., No. 126 Sqn.—On many occasions since his arrival in Malta this officer has participated in successful actions which have resulted in the destruction by him of at least five enemy aircraft.

Act. Flt. Lt. R. S. de V. LE MASURIER, R.A.F.V.R., No. 69 Sqn.—Since his arrival in Malta, Flt. Lt. Le Masurier has completed numerous operational sorties by night. These included bombing flights, reconnaissances and convoy protection duties, and have, without exception, been accomplished with efficiency, keenness and courage. On one occasion he participated in an action which caused the withdrawal of an Italian cruiser force which threatened one of our convoys.

Lighted Enemy Convoys

F/O. W. S. STOCKS, R.A.A.F., No. 221 Sqn.—While flying as captain of aircraft F/O. Stocks has given evidence of high qualities of leadership, coolness and efficiency. On several occasions he has successfully completed attacks on enemy shipping involving very considerable feats of airmanship. In one such operation recently two hits were obtained on an enemy vessel from a height of only 50 feet. Several times also he has illuminated convoys by dropping flares to enable torpedo aircraft to attack. His determination and ability were again demonstrated recently during a flight, in the course of which his wireless transmitter, rear turret and petrol gauges became unserviceable. Despite great difficulties, he continued and completed the operation successfully.

Act. Flt. Lt. J. W. SLADE, R.A.F.V.R., No. 126 Sqn.—Flt. Lt. Slade has participated in a large number of operational flights against the enemy both from this country and from Malta, and often against numerically superior enemy forces. He has destroyed two enemy aircraft and damaged others.

F/O. H. F. BICKERDIKE, R.A.F.V.R., No. 462 Sqn.—This officer has displayed great skill and tenacity in completing operations against heavily defended targets both in Europe and the Middle East.

F/O. A. E. MATHER, R.A.A.F., No. 104 Sqn.—F/O. Mather has completed numerous operational sorties against targets in Europe and in the Middle East. On one occasion he accomplished a daring bombing attack on Tobruk from a height of only 2,000 feet as weather at a higher altitude was adverse.

P/O. J. W. BURROUGH, R.A.F.V.R., No. 37 Sqn.—This officer has participated in attacks on targets in Libya, Crete, Greece and Tripolitania. On one occasion, when flying in daylight, his aircraft was attacked by several enemy fighters. In the ensuing engagement two of the crew were wounded. P/O. Burrough attended his comrades and then operated the front turret. Recently, when on a mine-laying operation, his aircraft was severely damaged by anti-aircraft fire and his navigator seriously injured. Nevertheless, with grim determination, this officer proceeded and brought his mission to a successful conclusion.

P/O. G. L. P. DUNSTONE, R.A.F.V.R., No. 69 Sqn.—As wireless operator/air gunner, P/O. Dunstone has taken part in many varied operations, including bombing raids reconnaissance, searches and anti-submarine patrols. On one sortie he scored a hit on a heavily protected tanker. He also participated with good effect in a recent action which resulted in the dispersal and retreat of Italian naval units.

P/O. V. G. HOGAN, R.A.F.V.R., No. 221 Sqn.—Since joining his squadron, this officer has evinced outstanding ability as a navigator. Frequently his coolness and quiet efficiency have surmounted many difficulties.

P/O. E. A. LOOS, No. 148 Sqn.—One night in August, 1942, this officer participated in an operational sortie with Tobruk harbour as its objective. In the course of this raid he hit an enemy ship several times and set it on fire. Repeating this exploit a few days later, in spite of bad weather, he again achieved success in causing an explosion and fires. On another occasion P/O. Loos, displaying outstanding coolness and efficiency in the face of difficulty, flew his aircraft back to base in spite of serious damage.

P/O. E. J. SAUNDERS, R.A.F.V.R., No. 40 Sqn.—As navigator, this officer has participated in numerous operational sorties, with much success. In the face of heavy opposition he has displayed exceptional coolness and daring. He has always pressed home his bombing attacks to the utmost, with efficiency and precision, and has been responsible for obtaining a number of very successful photographs of target areas.

F/O. P. B. WRIGHT, R.A.F.V.R., No. 610 Sqn.—F/O. Wright has always displayed great courage and skill, while his keenness and unflagging devotion to duty have set an admirable example.

DISTINGUISHED FLYING MEDAL.

Flt. Sgt. J. H. BELL, R.A.A.F., No. 37 Sqn.—Flt. Sgt. Bell has flown on many long-distance operational sorties, including attacks on targets in France, Germany, Italy, Cyrenaica, Crete, Tripolitania, Sicily and the Dodecanese. Throughout he has proved himself a most reliable wireless operator.

Flt. Sgt. L. W. HAUNTS, R.C.A.F., No. 40 Sqn.—Since May, 1942, Flt. Sgt. Haunts has taken part in many attacks on shipping at Tobruk and enemy transport at El Daba. In August, 1942, when detailed for an attack on Tobruk, he made a straight bombing run over an enemy merchant vessel despite extremely heavy defences. On leaving the target area a huge fire was seen to be burning. On another occasion, in September, 1942, this airman attacked a concentration of enemy motor transport in the battle area. He released his bombs from a low level, causing a fire in a petrol dump, and scoring several hits on motor transport vehicles.

Flt. Sgt. J. J. HEWITT, R.A.F.V.R., No. 69 Sqn.—Since his arrival in Malta, Flt. Sgt. Hewitt has taken part in several reconnaissance and bombing sorties. Previously he participated in several sorties over France and in anti-submarine patrols and convoy protection duties.

Flt. Sgt. D. P. HOBSON, R.C.A.F., No. 108 Sqn.—This captain of aircraft has displayed great tenacity of purpose, courage and devotion to duty. Despite an injury received in an aircraft crash, his enthusiasm for operational duties has remained undiminished.

Flt. Sgt. D. MCCABE, R.C.A.F., No. 104 Sqn.—As pilot, Flt. Sgt. McCabe has displayed a high degree of courage, skill and determination. He has participated in a large number of bombing sorties and has attacked Benghazi and Tobruk from very low altitudes.

Flt. Sgt. J. N. MCDONALD, R.A.A.F., No. 148 Sqn.—Flt. Sgt. McDonald was posted to Malta when the island was being "blitzed," and, as second pilot, made a number of successful operational flights. On one occasion his aircraft was caught in a barrage over Comiso and badly damaged. Nevertheless, it was flown back to base and a successful landing made during an enemy attack. Shortly afterwards, as captain, he was flying over Benghazi when the port petrol flap opened. The aircraft went out of control at 11,000 feet and descended to 4,000 feet before Flt. Sgt. McDonald, by skilful airmanship, regained control. He afterwards flew for five hours before he was able to make a safe landing.

Flt. Sgt. T. D. WITHINGTON, R.C.A.F., No. 108 Sqn. (since deceased).—Throughout his period of service Flt. Sgt. Withington has proved himself a captain of outstanding merit by his exceptional ability as a pilot and the confidence he has instilled in his crews. On a number of occasions when in the battle area, after dropping his bombs, he has descended to a low level and used his machine-guns. During the month of July, 1942, this airman participated in thirteen operational sorties, three of which were against long distance targets.

Flt. Sgt. W. H. STEPHENSON, R.C.A.F., No. 213 Sqn.—This airman has always displayed exceptional keenness to engage the enemy, and the highest resourcefulness and courage while in the air. Flt. Sgt. Stephenson has destroyed two enemy aircraft, and shared in the destruction of two others.

Flt. Sgt. (now Act. W/O.) G. G. SUTHERLAND, R.C.A.F., No. 108 Sqn.—As captain of aircraft Flt. Sgt. Sutherland has been detailed for operational duties over many heavily defended targets, and has invariably acquitted himself with courage and determination. On several occasions, when his aircraft has been damaged with consequent failure of apparatus, he has, with complete disregard of danger, persisted in his mission, and successfully secured hits on the target.

Mediterranean Navigation

Flt. Sgt. E. M. PIERCE, R.C.A.F., No. 104 Sqn.—As navigator and bomb aimer, Flt. Sgt. Pierce has taken part in operational sorties on targets at Benghazi, Tobruk, Greece, Crete and the battle areas. He has proved himself to be an outstanding navigator, whose ability has always enabled him to navigate his aircraft to the target, often in adverse weather. As a bomb aimer, Flt. Sgt. Pierce's courage and steadiness, under the most accurate fire, have materially assisted in the successes achieved.

Sgt. D. B. CHINERY, R.A.F.V.R., No. 148 Sqn.—Since November, 1941, Sgt. Chinery has flown continuously on operational sorties as rear gunner. Throughout he has set a fine example of keenness and devotion to duty, while his conduct has always been worthy of the highest praise.

Sgt. H. CLARK, No. 221 Sqn.—Sgt. Clark has taken part in a large number of successful sorties against enemy convoys in the Central Mediterranean. He has also participated in attacks on enemy submarines, obtaining three hits on one occasion.

SERVICE AVIATION

Sqn. Ldr. McDowall, D.F.M. and Bar, who is in charge of the tactical training of squadrons in a fighter group.

Air Marshal Sir Patrick Playfair, Commandant of the Air Training Corps, Eastern Command, inspecting a guard of honour while visiting an initial Training Wing in the Eastern Counties.

Sgt. (now Act. Flt. Lt.) W. R. CUNDY, R.A.A.F., No 260 Sqn.—In the course of numerous operational sorties over enemy territory, Sgt. Cundy has always displayed a keen desire to engage the enemy. He possesses fine qualities of leadership, keenness, and determination. On a recent occasion he displayed great skill in the destruction of an enemy aircraft which attacked a fellow-pilot.

Sgt. J. DODDS, No. 274 Sqn.—Since November, 1941, this pilot has gained a splendid record of operational flying in the Western Desert. In June, 1942, he destroyed two Macchi C.202s in one engagement. His total victories are thirteen aircraft destroyed.

Sgt. J. W. G. P. LETTINGTON, No. 108 Sqn.—During his duties with this squadron, Sgt. Lettington has invariably displayed the greatest enthusiasm and keenness. On several occasions he has completed bombing attacks in the face of severe opposition from enemy fighters and anti-aircraft fire. In August, 1942, he was particularly successful in securing excellent photographs of the target area, over which he spent considerable time at a low altitude. Damage to his aircraft and technical difficulties have not prevented him from bringing it safely back to base.

Sgt. J. B. MORRISON, No. 104 Sqn.—As captain of aircraft, Sgt. Morrison has displayed the utmost keenness and ability. He is a courageous and reliable pilot, who has completed a valuable series of operational flights.

Transport Strafing

Sgt. L. W. ROWLEY, No. 104 Sqn.—This sergeant has displayed outstanding courage and flying ability in the course of many and varied operations against the enemy. His coolness and flying skill have ensured the safe return of his aircraft from sorties over some of the most heavily defended targets in the Middle East. He has had exceptional success against enemy motor transport, and has frequently secured excellent photographs of his objectives

Sgt. A. MURRAY, No. 104 Sqn.—As rear runner, Sgt. Murray has taken part in many operational sorties, and by his keenness and cool thinking has always assisted his captain by his accurate directions. Over battle-area targets this airman has on several occasions identified especially large concentrations of enemy vehicles,, and directed his pilot in the bombing run.

Sgt. J. C. PERRY, No. 40 Sqn.—This captain of aircraft has always evinced the strongest desire to participate in operations. In September, 1942, he participated in an important double operation against concentrations of enemy transport and tanks in the battle area. Again in the same month, when attacking enemy shipping in Tobruk harbour, he persisted in his duties despite intense opposition from the defences.

Sgt. F. ROBINSON, No. 40 Sqn.—One night in September, 1942, Sgt. Robinson, as captain of aircraft, was detailed to attack a target at Tobruk. Despite severe anti-aircraft fire, which damaged his bomber and rendered the front turret unserviceable, Sgt. Robinson, by his skill and fine airmanship, was able to fulfil his mission and fly the aircraft safely to base.

Sgt. R. N. SHARD, No. 40 Sqn.—Sgt. Shard has a long and distinguished record of operational flying in sorties against targets in Italy and North Africa. One night in September, 1942, he was detailed to attack enemy concentrations in the battle area. He released his bombs, starting a fire in a petrol dump and another among enemy transport. After returning to base and resting for 40 minutes, he returned and attacked the same target.

Sgt. E. G. UPTON, No. 106 Sqn.—Sgt. Upton has displayed outstanding ability as a wireless operator in the course of many operational flights. In the face of danger from anti-aircraft fire, he has displayed exceptional courage, and a praiseworthy disregard for his own safety.

Sgt. J. S. DOVEY, No. 40 Sqn.—Sgt. Dovey has participated in several successful operations against the enemy. One night in December, 1942, owing to his skilful bomb aiming, a ship in La Goulette harbour was successfully attacked and set on fire. Later the vessel was observed to be exploding.

Flt. Sgt. R. C. RONSON, No. 159 Sqn.—One night in November, 1942, this airman was the rear gunner of an aircraft which attacked the airfield at Mingaladon. During the action his turret was hit by enemy fire and rendered unserviceable. Flt. Sgt. Robson suffered a broken leg, but, in spite of this, he dragged himself to the beam gun position, where the gunner lay wounded. Despite his injuries, Flt. Sgt. Robson manned the gun until the action was terminated.

B.E.M. (MIL.)

Sgt. E. WADE.—One night in September, 1942, Sgt. Wade was about to take off in his aircraft when another aircraft crashed on the flare path and burst into flames. Three fuel tanks exploded, Verey cartridges and ammunition detonated and there was a danger of a fourth petrol tank exploding. Sgt. Wade unhesitatingly entered the blazing fuselage and, finding the wireless operator in a dazed condition, helped him to safety just before the remaining petrol tank exploded and the fuselage collapsed. Sgt. Wade's prompt and gallant action undoubtedly saved the wireless operator's life.

L.A/C. H. R. CARTER, R.C.A.F., No. 409 (R.C.A.F.) Sqn.—One night in September, 1942, an aircraft struck a stores hut on an airfield, and burst into flames. L.A/C. Carter and another airman who were working near by hastened to the scene of the crash, and on arrival found that the perspex of the observer's astrodrome was broken. Despite the fact that the front of the aircraft was burning fiercely and the remaining petrol tanks were likely to explode, Carter climbed through the hole in the perspex in an endeavour to rescue the observer, who was in the middle of the aircraft and lying across the ammunition tanks. He had some difficulty in raising the observer, as a cord of the latter's helmet was wound round his face and caught on a projection in the aircraft, but Carter succeeded in freeing his comrade and in getting him under the astrodome. The other airman had, in the meantime, broken away pieces of the perspex, and with his assistance L.A/C. Carter lifted the observer out of the aircraft just as the ammunition began to explode. His courageous action undoubtedly saved the observer's life.

L.A/C. A. DARGUE.—L.A/C. Dargue was nursing orderly on a High Speed Launch during the combined operations on August 19th, 1942. In spite of wounds he endeavoured to carry out first aid to the wounded until he was picked up in a seriously wounded condition. The courage and valuable services rendered by L.A/C. Dargue are typical of the high qualities displayed by the nursing orderlies, who have carried out hazardous operations in High Speed Launches which play an essential part in Air Sea Rescue.

L.A/C. W. J. HITCHCOCK.—In May, 1942, a Wellington aircraft crashed in flames on a landing ground and the occupants were killed. L.A/C. Hitchcock displayed outstanding courage in removing most of the bodies from the blazing wreckage. Again, in August, 1942, a Kittyhawk aircraft crashed in flames on the same landing ground. L.A/C. Hitchcock rushed from the fire tender with a hose, disappeared into the flames and shortly reappeared carrying the body of the pilot. With the assistance of another member of the crew he managed to get the body clear of the burning wreckage.

SERVICE AVIATION

Awards of Foreign Decorations

THE KING has granted unrestricted permission for the wearing of the undermentioned decorations and medal conferred on the officers and airmen indicated, in recognition of valuable services rendered in connection with the war:—

Conferred by the Queen of the Netherlands

ORDER OF ORANGE NASSAU.

GRAND CROSS.

Air Chief Marshal Sir R. E. C. PEIRSE, K.C.B., D.S.O., A.F.C., R.A.F.

COMMANDER.

Grp. Capt. B V. REYNOLDS, R.A.F.

CHEVALIER.

W/O. J. A. DAVEY, R.A.F.

SILVER MEDAL.

Sgt. P. WOOLRYCH, R.A.F.

Conferred by the Provisional Czechoslovak Government

ORDER OF THE WHITE LION.

Air Chief Marshal Sir W. S. DOUGLAS, K.C.B., M.C., D.F.C., R.A.F.

Air Chief Marshal Sir C. F. A. PORTAL, G.C.B., D.S.O., M.C., R.A.F.

Act. Air Marshal J. E. A. BALDWIN, K.B.E., C.B., D.S.O., R.A.F.

Act. Air Cmdre. F. BEAUMONT, R.A.F.

CZECHOSLOVAK MILITARY CROSS.

Grp. Capt. C. H. APPLETON, D.S.O., D.F.C., R.A.F.

Wing Cdr. J. N. H. WHITWORTH, D.S.O., D.F.C., R.A.F.

Act. Sqn. Ldr. R. C. BISSET, D.F.C., R.A.F. (since deceased).

Act. Sqn. Ldr. M. H. BROWN, D.F.C., R.A.F.

Act. Sqn. Ldr. T. G. MAHADDIE, A.F.C., R.A.F.

Flt. Lt. J. B. J. BOARDMAN, R.A.F.

Flt. Lt. A. S. PHILLIPS, R.A.F.V.R.

F/O. K. N. GRAY, D.F.C., R.A.F. (since deceased).

F/O. G. E. SADDINGTON, R.A.F. (since deceased).

CZECHOSLOVAK MEDAL FOR BRAVERY.

Act. Flt. Lt. T. J. D. BABER, R.N.Z.A.F. (since deceased).

Roll of Honour

Casualty Communiqué No. 203.

THE Air Ministry regrets to announce the following casualties on various dates. The next of kin have been informed. Casualties "in action" are due to flying operations against the enemy; "on active service" includes ground casualties due to enemy action, non-operational flying casualties, fatal accidents and natural deaths.

Royal Air Force

KILLED IN ACTION.—Sgt. H. D. F. Amor; Sgt. J. B. Burton; Sgt. F. Craven; P/O. A. Easton; Act. Flt. Lt. P. G. Felce; Act. Flt. Lt. R. J. Hannan, D.F.C.; Flt. Sgt. T. H. Harris; P/O. C. W. Higgins; Flt. Sgt. G. E. Hills; Sgt. D. T. Howard; Sgt. W. S. Hughes; Sgt. J. K. B. Lee; P/O. A. L. McEwen; Flt. Sgt. R. F. Martin; P/O. J. Philp; Flt. Sgt. M. L. Pierpoint; Sgt. E. D. Piper; Sgt. A. Roberts; Sgt. J. Sanders; Sgt. P. J. Thompson; P/O. E. J. C. Wheble; Flt. Sgt. T. G. Williams.

PREVIOUSLY REPORTED MISSING, BELIEVED KILLED IN ACTION, NOW PRESUMED KILLED IN ACTION.—P/O. R. W. Charters; Flt. Sgt. E. L. Styles.

PREVIOUSLY REPORTED MISSING, NOW PRESUMED KILLED IN ACTION.—P/O. A. R. Bray; Flt. Sgt. E. R. Dimond; P/O. F. A. Hurley; Sgt. A. W. McF. Robertson; Sgt. K. G. Rogers; Sgt. D. McG. Symes; Sgt. R. M. Wilkinson.

WOUNDED OR INJURED IN ACTION.—Act. Flt. Lt. L. G. Bedford; F/O. W. T. H. Jennings; Sgt. A. Liddle; Sgt. L. Lowery.

DIED OF WOUNDS OR INJURIES RECEIVED IN ACTION.—Sgt. F. Foster; Flt. Sgt. M. J. Friar.

MISSING, BELIEVED KILLED IN ACTION.—P/O. A. H. Childs; P/O. N. A. Lavers; Act. Flt. Lt. R. H. Williamson.

MISSING.—Sgt. C. G. Adams; Sgt. R. T. Baldwin; Sgt. J. M. M. Billing; Flt. Sgt. H. J. Birtwistle; L.A/C. E. W. Blanchard; P/O. J. Bluck; Sgt. T. F. Blythe; P/O. E. M. W. Bolton; Sgt. F. E. A. Box; Wing Cdr. P. H. Bragg; P/O. K. G. V. Brown; Sgt. G. Bull; L.A/C. R. S. Candy; Sgt. T. W. Catchpole; Sgt. A. Cooke; A/C.1 H. Croft; L.A/C. D. G. Davies; Flt. Sgt. F. Davies; Cpl. R. P. Diment; Sgt. A. B. Fawcett; Sgt. R. A. Giles; Flt. Sgt. J. A. Gore; P/O. A. G. Grant; Act. Flt. Lt. W. MacK. R. Griffin; Sgt. W. Haigh; Cpl. S. H. Hamlett; Act. Flt. Lt. C. A. Harrap; Sgt. G. R. Haugh; Sgt. W. N. Hopwood; Sgt. J. S. Izatt; Sgt. W. H. P. Kelleher; L.A/C. R. R. Kelsey; P/O. L. K. Kershaw; Sgt. B. J. Ketchell; P/O. J. M. N. Legranti; W/O. H. G. Matthews; P/O. J. O. Mathias; Sgt. H. G. J. Middleton; W/O. E. T. Millis; Sgt. T. L. Mincher; Act. F/O. E. G. Nichols; Sgt. W. C. Parry; Flt. Sgt. S. Rhodes; Sgt. F. Roach; W/O. G. Roche; Sgt. A. E. Sedin; Sgt. W. Shirley; P/O. F. S. Snelling; Sgt. P. S. Tutton; P/O. J. R. P. Taylor; Sgt. H. P. Teale; P/O. D. Truscott; W/O. F. Tyler; Sgt. E. J. J. Villars; P/O. M. Vincent; Sgt. C. F. Ward; Sgt. T. C. Westwood.

KILLED ON ACTIVE SERVICE.—L.A/C. A. Allan; L.A/C. R. H. Archer; Flt. Sgt. J. C. Binge; Sgt. W. A. Baillie; Act. Sgt. G. D. F. Buchan; Sgt. J. E. Charker; A/C.1 G. Clarke; Act. Sgt. D. Coford; Sgt. E. Cookson; Sgt. J. W. Egan; L.A/C. S. A. Gallagher; Sgt. B. J. Gear; Sgt. L. E. Harrison; Sgt. J. F. Holmes; Flt. Lt. A. B. Lennie; Flt. Lt. J. Lonsdale; Sgt. B. Lowery; Sgt. R. McCleod; P/O. R. H. Payne; Sgt. R. G. Percival; Sgt. C. Pickering; P/O. K. J. D. Rawlins; Sgt. H. M. Rikard-Bell; L.A/C. S. R. Shieff; Sgt. D. P. C. Simmons; Sgt. A. R. Sowden; Flt. Sgt. J. P. Standring; Act. Sgt.

THE STARS IN THEIR COURSES: Navigators being shown a map of the night sky as they will see it from the astrodome when flying above the clouds.

SERVICE AVIATION

L. G. L. Stubbs; Sgt. V. S. Swale; P/O. G. H. Thomson; L.A/C. P. R. H. Travell; Sgt. H. G. Williams; P/O. P. McK. Willis.

PREVIOUSLY REPORTED MISSING, BELIEVED KILLED ON ACTIVE SERVICE, NOW PRESUMED KILLED ON ACTIVE SERVICE.—A/C.1 R. Grierson.

WOUNDED OR INJURED ON ACTIVE SERVICE.—Cpl. M. Blythe; Flt. Sgt. G. Boylan; A/C.1 A. H. Edgar; Cpl. H. Frazer; Cpl. K. D. Gallagher; P/O. F. Kaegi; P/O. N. G. McClennan; Sgt. D. J. Oxer; L.A/C. W. E. Reakes; P/O. F. S. Salter; Act. Wing Cdr. G. R. Scott-Farnie; A/C.1 P. Shaw F/O. F. B. Sowrey; Sgt. J. W. C. Spencer; W/O. T. R. Williams.

DIED OF WOUNDS OR INJURIES RECEIVED ON ACTIVE SERVICE.—A/C.2 E. B. Bennett; Flt. Lt. H. F. Blackburn; Sgt. J. Bracegirdle; Cpl. E. Burgess; Cpl. P. R. Compton; Sgt. G. E. B. Daniels; Sgt. D. M. Dymond; Cpl. J. T. Finch; Cpl. T. C. Green; Cpl. W. Hamilton; Cpl. J. M. Harrow; Cpl. G. H. Howgate; Sgt. E. Kay; Sgt. J. Kirkham; Sgt. J. H. Leadley; L.A/C. P. J. McGonigle; Sgt. W. A. C. Mann; W/O. S. J. Mott; Cpl. J. Murphy; P/O. P. G. Oakes; Sgt. S. F. Partington; Sgt. J. N. Smith; Wing. Cdr. M. G. Stevenson; Sgt. R. S. Ware.

DIED ON ACTIVE SERVICE.—L.A/C. G. W. Braithwaite; Flt. Sgt. S. Callaghan; Sgt. W. J. Clinton; Cpl. E. J. Cox; A/C.2 J. W. Darlow; A/C.1 G. K. Gardner; A/C.2 A. Goodfarb; L.A/C. J. A. Mitchell; L.A/C. F. A. Newman; A/C.1 R. C. Owen; Sgt. B. Pickering; L.A/C. S. W. Price; A/C.1 W. Ritchie; Sgt. N. F. Ventham.

PREVIOUSLY REPORTED MISSING, NOW REPORTED PRISONER OF WAR.—Sgt. J. A. Kilner.

Women's Auxiliary Air Force

WOUNDED OR INJURED ON ACTIVE SERVICE.—A/CW.1 V. C. Street; A/CW.1 M. L. Summerson.

DIED OF WOUNDS OR INJURIES RECEIVED ON ACTIVE SERVICE.—A/CW.1 M. E. Hughes.

DIED ON ACTIVE SERVICE.—A/CW.2 C. S. Patterson; Cpl. S. E. Wilson.

Royal Australian Air Force

PREVIOUSLY REPORTED MISSING, BELIEVED KILLED IN ACTION, NOW PRESUMED KILLED IN ACTION.—P/O. A. D. Roberts

PREVIOUSLY REPORTED MISSING, NOW PRESUMED KILLED IN ACTION.—Sgt. L. W. Hanson; Sgt. H. Janney; Sgt. J. M. Shiner

MISSING.—Sgt. T. Bell; Sgt. L. E. Barnard; P/O. N. A. Davies; Sgt. H. J. Fraser; Sgt. A. N. Jones; F/O. H. I. Lethbridge; F/O. O. L. Loane.

KILLED ON ACTIVE SERVICE.—P/O. R. G. S. Burrows; Sgt. J. E. Fazel; Sgt. G. D. Humphrey; Sgt. C. L. Hutchesson; P/O. H. S. O'Donnell.

WOUNDED OR INJURED ON ACTIVE SERVICE.—Sgt. G. G. Dowling.

DIED ON ACTIVE SERVICE.—Cpl. M. R. Ifield.

Royal Canadian Air Force

KILLED IN ACTION.—P/O. L. Mount; Sgt. S. W. Scott.

PREVIOUSLY REPORTED MISSING, BELIEVED KILLED IN ACTION, NOW PRESUMED KILLED IN ACTION.—Sgt. W. H. Bracken; Flt. Sgt. G. J. P. Kearns.

PREVIOUSLY REPORTED MISSING, NOW PRESUMED KILLED IN ACTION.—Sgt. J. H. Daughney; Sgt. W. V. Donahue; P/O. I. F. Hoidas; W/O. A. Jenkins; Sgt. E. J. Jones; P/O. C. L. Szumlinski; Sgt. R. E. Wilson.

DIED OF WOUNDS OR INJURIES RECEIVED IN ACTION.—Sgt. L. O. Colbran; Sgt. M. R. Constable; Flt. Sgt C. H. Lanceley.

MISSING.—Sgt. H. C. Ballinger; Sgt. J. Cachia Sgt. G. E. Cronk; Sgt. F. H. De Nevers; P/O. E. D. Fleishman; Sgt. R. H. Galipeau; Sgt. G. C. Haig; Sgt. R. Hayes; Sgt. R. G. Hill; Sgt. R. A. Lockhart; Sgt. H. F. Macarthur; Sgt. C. A. Massey; Sgt. L. E. Mathews; Sgt. S. F. Mattoon; P/O. J. D. J. Rodger; P/O. J. R. Scott; Sgt. P. Sutherland; F/O. D. R. Thomson; Sgt. D. S. Urquhart; F/O J. B Wilson.

MISSING, BELIEVED KILLED ON ACTIVE SERVICE.—Sgt. R. E. McRitchie.

KILLED ON ACTIVE SERVICE.—P/O. W. R. Bower; Sgt. R Clarke; Flt. Sgt. D. L. Rawson.

DIED ON ACTIVE SERVICE.—Sgt. W. J. Perry.

Royal New Zealand Air Force

KILLED IN ACTION.—Sgt. B. L. McK. Jenkin.

PREVIOUSLY REPORTED MISSING, NOW PRESUMED KILLED IN ACTION.—Sgt. L. H. Baxter; Sgt. T. H. Gray; Sgt. A. J. MacGregor; Sgt. H. T. O. McMahon; Flt. Sgt. T. S. Mahood; Sgt. C. C. Wrightson.

MISSING, BELIEVED KILLED ON ACTIVE SERVICE.—Sgt. N. J Barlow

WOUNDED OR INJURED ON ACTIVE SERVICE.—L.A/C. A. C. Lobban.

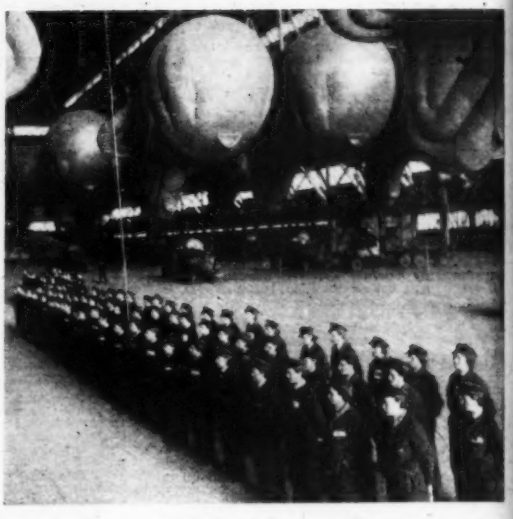
DIED OF WOUNDS OR INJURIES RECEIVED ON ACTIVE SERVICE.—Sgt. L. J. Casey; L.A/C. H. E. Sumner.

South African Air Force

KILLED IN ACTION.—Lt. I. H. Nolte.

MISSING.—Lt. P. Campbell.

In a shed of huge dimensions — censor will not let us say where — balloon operator trainees of the W.A.A.F. parade before going off duty for the day.



Casualty Communiqué No. 204

Royal Air Force

KILLED IN ACTION.—Sgt. T. H. Allen; Flt. Sgt. E. A. Allgood; Sgt. J. L. Borrowdale; P/O A. W. Davis; Sgt. W. G. England; Sgt. R. J. Guntrip; Sgt. E. J. White.

PREVIOUSLY REPORTED MISSING, BELIEVED KILLED IN ACTION, NOW PRESUMED KILLED IN ACTION.—Flt. Lt. D. P. Wade; Sgt. R. R. Waterston.

PREVIOUSLY REPORTED MISSING, NOW PRESUMED KILLED IN ACTION.—P/O. P. McL. Allardice; Sgt. J. C. L. Banks; Sgt. R P. Cale; Sgt. L. K. Eagle; Flt. Lt. J. H. Edwards; Flt. Sgt. J. T. Graham; Sgt. S. H. Greene; Sgt. R. V. Griffiths; Flt. Lt. W. R. Hole; Sgt. A. W. Newhouse; Flt. Sgt. K. M. Nichols; P/O. J. H. Reid; Flt. Sgt. D. O. Rickard; Sgt. J. Smith; Sgt. D. E. S. Sydney-Smith.

WOUNDED OR INJURED IN ACTION.—Sgt. A. Shayshutt.

DIED OF WOUNDS OR INJURIES RECEIVED IN ACTION.—Flt. Sgt. T. J. Culnane; Sgt. B. F. Smith.

MISSING, BELIEVED KILLED IN ACTION.—Sgt. F. M. Browne; Sgt. S. Brownhill; P/O. J. A. Bruce; Sgt. F. J. Eden; Sgt. P. A. J. Grant; P/O. P. E. Helmore; Sgt. D. C. Langford; Sgt P. J. Turner.

MISSING.—Sgt. W. G. Archer; Act. Flt. Lt. J. C. Atkinson; Wing Cdr. F. G. L. Bain; Sgt. H. H. Barker; Sgt. A. M. Bartlett; Sgt. A. Bateman; Flt. Sgt. A. D. Blackburn; Sgt. R. Boarman; P/O. E. S. Burrows; Sgt. A. Cameron; Sgt. J. H. Carter; Sgt. G. E. H. Ceeney; Sgt. E. Clark; Sgt. C. G. Clegg; Sgt. F. Clegg; Sgt. J. A. Clough; P/O. K. C. W. Cope; P/O. J. P. Cranstoun; Sqn. Ldr. G. A. Denby, D.F.C.; Sgt. P. W. Ditchburn; Sgt. W. H. Ellis; Sgt. L. P. J. French; Sgt. R. Fryer; Sgt. A. Ganderton; P/O. M. H. Good; P/O. V. N. Gwyer; Sgt. D. M. Haycock; Sgt. W. Hingley; Sgt. D. Holmes; Flt. Sgt. S. F. Hope; Sgt. S. H. Hopkinson; Sgt. G. M. Hurley; P/O. R. R. Hustwaite; Flt. Sgt. J. P. Iredale; Sgt. B. Jones; Sgt. C. R. Long; Sgt. C. Lucas; Sqn. Ldr. C. G. H. E. Lumsden; Sgt. D. P. McAleese; Sgt. K. Magness; Sgt. F. Martin; Flt. Sgt. P. H. Murray; Act. Flt. Lt. D. A. Nicoll, D.F.C.; Sgt. J. M. Reilly; Sgt. D. R. Riley; Sgt. L. A. Roll; F/O. F. P. Saunders; P/O. N. F. Sibley; Flt. Sgt. D. G. Smith; Sgt. J. L. Strachan; Sgt. W. T. Taylor; Sgt. T. J. Thompson; Sgt. B. K. Trubshaw; L.A/C. H. V. Waite; Sgt. F. H. K. Wade; Act. Sqn. Ldr. B. J. Wicks, D.F.C.; Sgt. H. T. Williams; Sgt. R. H. Williams; Sgt C. D. Wilson; Sgt J. Wood.

KILLED ON ACTIVE SERVICE.—Sgt. T. P Attridge; Sgt. T. Beattie; Sgt. D. E. Bernstein; Sgt. R. G. Board; L.A/C. S. I. Bressloff; Sgt. T. Buckley; L.A/C. H. Burroughs; L.A/C. C. G. Chadwick; Sgt. D. S. Colley; A/C.1 G. M. Cooke; Sgt. G. M. Cridge; Sgt. P. Dennerly; Sgt. S. L. Drayton; F/O. A. P. C. Dunlop; P/O. J. F. Emeney; Sgt. J. H. Glass; Sgt. G. W. Hatton; Sgt. R. Holden; Sgt. F. Hooton; L.A/C. E. Johnson; P/O. E. H. Jones; Sgt. J. R. D. Jones; Sgt. A W. Knott; L.A/C. J. R. Knowles; Flt. Sgt. A. F. Martin; F/O. G. O'Connell; Flt. Lt. E. O. Richards; L.A/C. G. Ross; L.A/C. T. Rutherford; Sgt. L. F. Seeley; Sgt E. W. Smith; L.A/C R. P. W. Stevens; L.A/C. L. A. E. Stokes; A/C.1 N. W. Taylor; Cpl. E. A. F. Thomson; Sgt. N. Wade; Sgt. E. J. Waterman; Sgt. J. E. Westfield; Sgt. H. L. J. Wilkins; Sgt. O. W. Woodhead.

PREVIOUSLY REPORTED MISSING, NOW PRESUMED KILLED ON ACTIVE SERVICE.—Sgt. A. T. G. Gough; Sgt. R. J. Harwood; Sgt. P. J Leahy; Sgt. J. McClelland; Flt. Sgt. R. C. Smith.

WOUNDED OR INJURED ON ACTIVE SERVICE.—P/O. P. L. Bateman-Jones; Flt. Sgt. D. A. Bye; Sgt. R. J. C. Diamond; F/O. G. A. P. Duhy; L.A/C. C. McDermott; P/O. J. A. H. Pinny; Sgt. G. C. A. Vanneck.

DIED OF WOUNDS OR INJURIES RECEIVED ON ACTIVE SERVICE.—Sgt. C. Knight; F/O. M. G. F. Nockolds.

DIED ON ACTIVE SERVICE.—A/C.1 G. Adams; A/C.1 M. W. Armitage; L.A/C. H. Bowering; L.A/C. G. E Butt; A/C.2 F. E. Elston; A/C.2 I. M. Gelernter; A/C.1 R. E. Howse; Cpl. C. F. Maynard; L.A/C. R. H. Nelson; F/O O. Rixham; A/C.1 J. Roberts; A/C.2 H. Sinnock; A/C.2 W. N. Strudwick; A/C.2 J. Thwaites; Act. Wg. Cdr. Sir R. D. Waterhouse; A/C.2 D. Watts.

PREVIOUSLY REPORTED MISSING, NOW REPORTED PRISONER OF WAR.—Sgt. I. F. L. Arthur; Sgt. G. Bonnar; Sgt. N. Crutchley; P/O. T. E. Errington.

Royal Australian Air Force

WOUNDED OR INJURED IN ACTION.—Sgt. R. M. Burcher

MISSING, BELIEVED KILLED IN ACTION.—P/O. M. H. I. De Cosier; Sgt. D. A. Milligan; Act. Flt. Lt. J. W. Yarrs, D.F.M.

MISSING.—Sgt. W. E. Lodge; Sgt. J. C. O'Neill; F/O. P. W. Rowling; Sgt. H. W. J. Smith; F/O. C. W. Walker.

KILLED ON ACTIVE SERVICE.—Sgt. R. W. Dickson.

WOUNDED OR INJURED ON ACTIVE SERVICE.—P/O N. C. Potts.

Royal Canadian Air Force

KILLED IN ACTION.—Sgt. S. G. Napier.

MISSING, BELIEVED KILLED IN ACTION.—Sgt. C. H. L. Bell; Flt Sgt. J. G. Clements; Sgt. W. T. Cranna; Sgt. R. W. Hughes; Sgt. W. Jackson; Sgt. W. T. B. McBratney; Sgt. J. McCartney; Flt. Sgt. E. C. McLean; Sgt. W. Pedersen; Sgt. F. P. Quinn; Sgt. J. D. Williams.

MISSING.—Sgt F. Burrill; F/O. E. H. Derick; Flt. Sgt. G. S. Edwards; Flt. Sgt. R. E. Gorman; P/O. M. Holub; F/O. M. T. Izzard; Sgt. W. W H Lavers; Sgt. W H. D Spence; Sgt. M. B. St. Louis.

KILLED ON ACTIVE SERVICE.—L.A/C. J. V. R. Beaudry; Sgt. A. L. Beckwall; Sgt. H. Bordewick; Sgt. A. C. Bradley; Sgt. C. Brown; Sgt. S. S. Clark; F/O. B. H. Enns; W/O. S. F. Gannon; Sgt. A. G. B. Gibson; Act. Flt. Lt. F. H. Glazebrook, D.F.C.; Sgt. O. D. C. Hamel; Sgt. D. S. Hill; Sgt. D. S. Hutt; Sgt. D. E. Johnson; Sgt. J. Jones; Sgt. W. M. Kostenuk; Sgt. E. McGillivray; F/O. S. P. Mariatt; Sgt. R. E. Milliken; Sgt. W. S. Milne; Sgt. N. W. Ross; Sgt. M. J. Stanley; Sgt. G. R. I. Taylor; Flt. Sgt. G. H. Turcotte; P/O J. W. Williams, D.F.C.

WOUNDED OR INJURED ON ACTIVE SERVICE.—Sgt. J. A. McLeod

Royal New Zealand Air Force

MISSING, BELIEVED KILLED IN ACTION.—Sgt. F. W. Norris; Sgt. L. W Streeter; Sgt. W. G. H. White.

MISSING.—Sgt. E. L. D. Ashwin; Sgt. C. H. Brandon; Sgt. A. G Brown; P/O. G. M. Cunningham; F/O. G. H. Jacobson; Sgt. W. D. McAlpine; P/O. T. D. G. Murray; Sgt. D. Newman; P/O. R. C. Smart; Sgt. W. F. Stokes.

KILLED ON ACTIVE SERVICE.—F/O. F. Chambers; F/O. A. E. Dinnie; P/O. R. L. Ewert; P/O. S. N. Harrison; P/O C H. E. Jay; Sgt. C. R. Morgan.

South African Air Force

KILLED ON ACTIVE SERVICE.—2/Lt. N. A. Chambers.

WOUNDED OR INJURED ON ACTIVE SERVICE.—Air Mech. A. B Methuen.

OFFICIAL CORRECTIONS.

to Casualty Communique No. 201. R.A.A.F., under "MISSING" delete P/O. H. Clark. S.A.A.R., under "MISSING," Major A. C. B. Metelerkamp to go under "KILLED IN ACTION."